

RADIO & TELEVISION NEWS

RADIO-ELECTRONIC
ENGINEERING
EDITION



**OFFICE TELETSETS
PROVIDE NEW VIDEO MARKET**

Page 45

NEWEST

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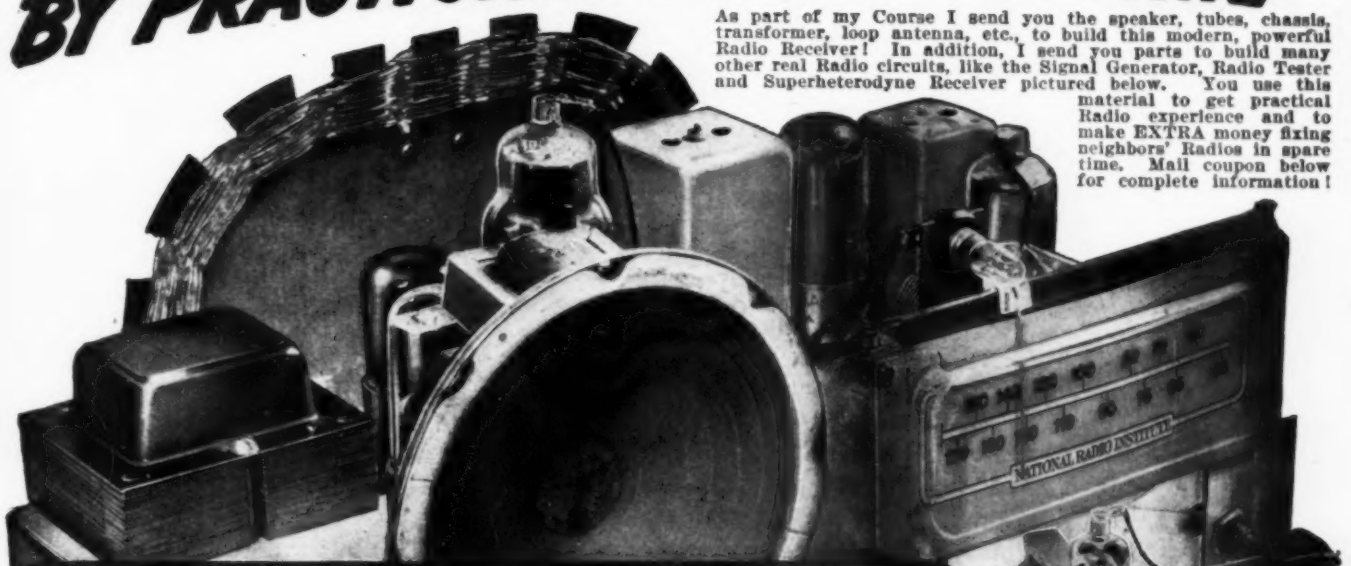
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COVER PHOTO: Custom television installation at Passaic, New Jersey home office—Allen B. DuMont Laboratories, Inc. Dr. DuMont can control the operation of the set (which provides AM, FM, and short-wave coverage besides video) from a remote control panel in drawer. (Photo by Charles Haacker)

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CONTENTS

NOVEMBER, 1948

Microwaves for Relaying TV Programs.....	Samuel Freedman	35
Adapting Webster Record Changers for Microgroove Recordings.....	Robert W. Timmerman, W8YIF	39
Screen Grid Modulation.....	Alva Wilson, W5DAD	40
A Low-Cost Mobile Station.....	Robert Lewis, W8MQU	42
Novel Controlled Rectifier.....	S. S. Peschel	44
Custom-Built Telesets Provide New Video Market.....	Austin C. Lescarbours	45
How to Use Sweep Generators with TV Receivers.....		46
Sell Your Service.....	John B. Ledbetter	49
The Recording and Reproduction of Sound (Part 21).....	Oliver Read	50
A Compact Superhet Tuner.....	John F. Clemens, W9ERN	52
New Trends in Receiver Design (Part 4).....	W. William Hensler	54
An Inexpensive "Ladder" Type Mast.....	Nicholas Lefor, W2BIQ	57
Mac's Radio Service Shop.....	John T. Frye	58
Build Your Own Communications Receiver (Part 4).....	J. T. Goode	59
An A.C.-D.C. Receiver for AM and FM.....	W. A. Harris and R. F. Dunn	62
Stop That Pedestrian.....	Alvin B. Kaufman	66
A Compact Distortion Meter.....	Rufus P. Turner, W1AY	68
Modern Television Receivers (Part 8).....	Milton S. Kiver	70
A Grid Bias Supply for Class "B" Modulators.....	H. C. Sherrod, W5ZG	94
Low-Cost Multimeter.....	Abe Siegel	100
What? Where? and Why?.....	Nicholas B. Cook	118

DEPARTMENTS

For the Record.....	The Editor	8	What's New in Radio.....	82
Spot Radio News.....		16	New Receivers	170
Within the Industry.....		26	Technical Books	182
Short-Wave.....	K. R. Boord	65	Manufacturers' Literature	184
AFCA News		204		



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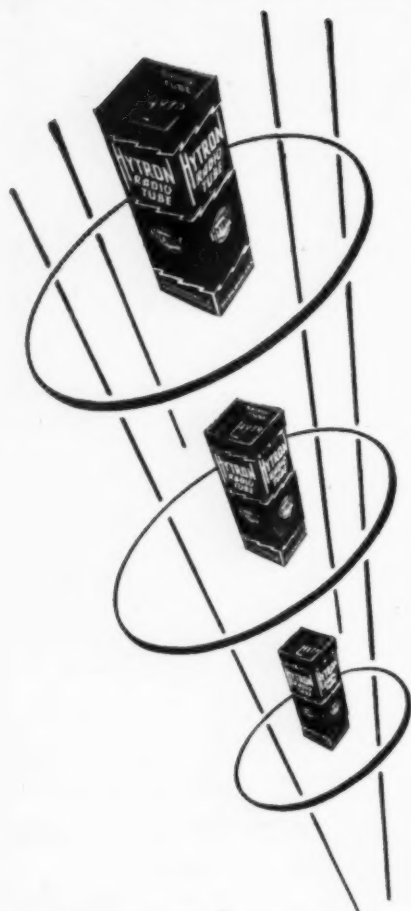
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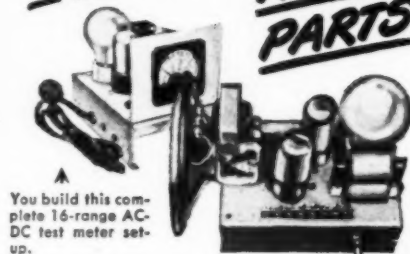
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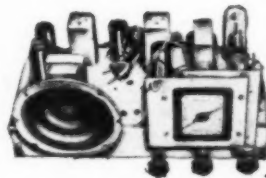
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For the **RECORD.**

● BY THE EDITOR

ARE YOU READY FOR TELEVISION?

ALMOST daily the mails bring reports of new television stations coming on the air for the first time with their test patterns preparatory to the start of their regular programming schedules. In the majority of cases these stations are located in areas that have not enjoyed television before.

Many more stations are scheduled for operation in the near future and many of our readers have asked when they will get television in their city or town. It is almost certain now that the installation and servicing of the majority of video receivers in present and future areas will be done by local servicemen, either on a contract basis with the manufacturer, or as independents.

Only servicemen with proper technical and mechanical training can hope to benefit by this new market for their services. If you are not presently qualified there are several ways to prepare yourself for this new opportunity that is television, either by home study or at one of the many excellent television schools, or both.

According to *Television Digest*, the following new stations were scheduled to be on the air by the end of October. Most, if not all of them, will probably be operating by the time you receive your copy of this issue.

WJZ-TV New York; WUTV Indianapolis; WSB-TV Atlanta; WENR-TV Chicago; KOB-TV Albuquerque; WAAM Baltimore. WOIC Washington; WNBQ Chicago; WXYZ-TV Detroit; WMCT Memphis; WTTV Bloomington, Ind.; WAVE-TV Louisville; WAGA-TV Atlanta; WBAP-TV Fort Worth; KNBH and KLAC-TV Los Angeles; WTVO Detroit; WDTV Pittsburgh; WNBK Cleveland; WTCN-TV Minneapolis; and KTTV Los Angeles.

November will see these stations on the air; WDSU-TV New Orleans; KECA-TV Los Angeles; KPIX San Francisco; and KFMB-TV San Diego.

December brings WXEL Cleveland; KGO-TV and KRON-TV San Francisco; WDEL-TV Wilmington, Del.; WGAL-TV Lancaster, Pa.; and WLWD Dayton, Ohio.

For January 1949 operation; WOR-TV New York; WHTM Rochester, N. Y.; WKRC-TV and WCPO-TV Cincinnati; WHIO-TV Dayton, Ohio; WLWC Columbus, Ohio; and WOW-TV Omaha.

In February, WSEE St. Petersburg, Fla.; and WKY-TV Oklahoma City.

For March, WFBM-TV Indianapolis; WOC-TV Davenport; and WBRC-TV in Birmingham, Ala., are scheduled.

WJAR-TV Providence, R. I.; WHAS-TV Louisville; KRLD-TV Dallas; and WMBR-TV are scheduled for Spring and early Summer of 1949.

Fall of 1949 will bring WSyr-TV Syracuse, New York; WJAC-TV Johnston, Pa.; WCON-TV Atlanta, Georgia; and WAFM-TV Birmingham, Alabama.

Other stations for 1949 operation, with operating dates still undetermined are: WAGE-TV Syracuse, N. Y.; WNBK-TV Binghamton, N. Y.; WBNT Columbus, Ohio; WBT-TV Charlotte, N. C.; WFMV-TV Greensboro, N. C.; WHBF-TV Rock Island, Ill.; WDAF-TV Kansas City; WOAI-TV San Antonio; WOIT-TV Ames, Iowa; and KEYT Omaha.

In addition to those stations listed, there are many more who will probably be in operation during 1949. A great many of the stations holding construction permits have already received delivery of their equipment, and are looking forward to early operation as soon as construction is completed.

Each area with a television station now in operation or in prospect, presents a new market for the wide-awake serviceman. All the receivers will require some measure of service as well as an original installation.

As additional stations come on the air in each area, the antenna systems of the receivers will probably require some re-adjustment for optimum performance on the new channels.

The appearance of additional stations serves to stimulate interest greatly, as the quality of the program material generally improves with competition.

By the end of 1949 there will be no major metropolitan area, without some measure of television service. The new combination coaxial and microwave link between Chicago and New York, including towns along the route will do much to improve the quality of the program material presented, and in turn increase the public's interest in television. Within the next two years, this system will extend across the country, affording coast-to-coast telecasts.

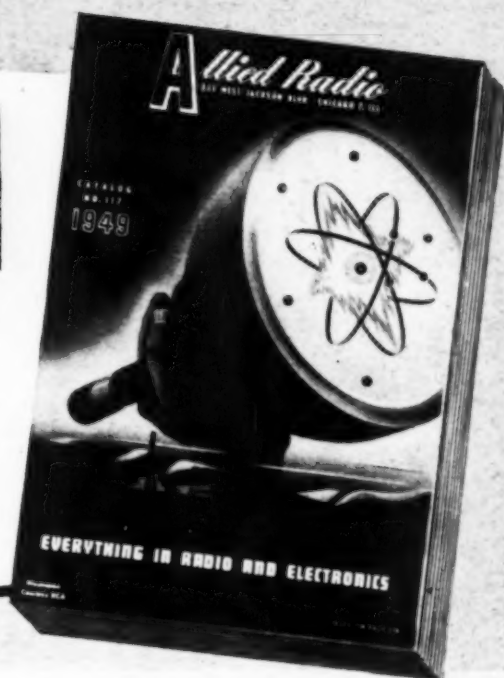
The future of television is assured, but only the *qualified* serviceman will be able to cash in on Video's opportunities.O.R.

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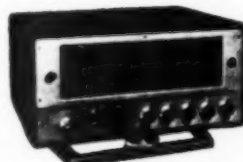
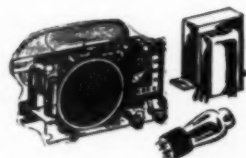
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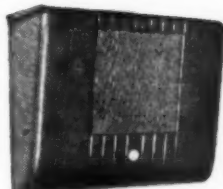
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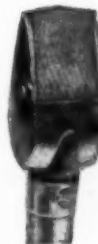
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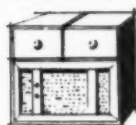
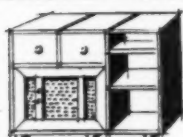
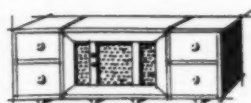
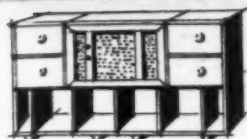
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1	27	1	2200	10	47000	10	1.0 meg.
1	47	3	2700	1	68000	1	1.5 meg.
1	100	5	4700	1	82000	1	2.2 meg.
1	150	1	6800	10	0.1 meg.	1	2.7 meg.
1	270	10	10000	5	0.15 meg.	1	3.9 meg.
1	330	3	15000	1	0.22 meg.	1	4.7 meg.
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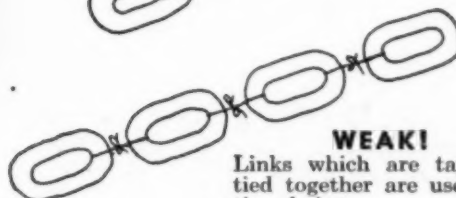
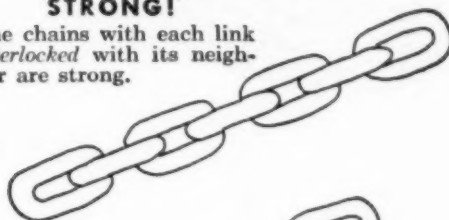
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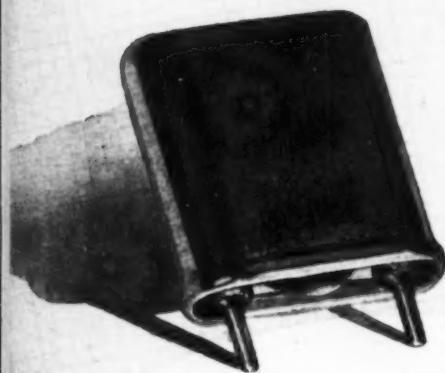
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By RADIO & TELEVISION NEWS'
WASHINGTON EDITOR

WASHINGTON WILL BE quite a TV news center this fall and winter. With the FCC hearings on the effects of tropospheric interference on present and proposed allocations, high-band TV and general interference problems, reams of vital information and decisions affecting the future of television will be on the wires from Washington.

The most spectacular hearings, those on high-band TV, will reveal what industry has done and can do at the higher frequencies and thus provide a pattern of planning for many years to come. Typical puzzling problems which industry specialists will analyze include the areas of service which might be expected in the 474-, 600-, and 890-megacycle bands with equipment having bandwidths of 6, 13, or 20 mc. Radiated power possibilities, co-channel and adjacent-channel separations, and the number of channels which would be available in the 140 metropolitan districts, are other major topics which will be probed by the experts.

At this writing, representatives of all of the leading telecasters, broadcasters, component, receiver and transmitter manufacturers, were scheduled to appear at the Washington sessions: *Philco Corporation, Philco Television Broadcasting Corporation, Television Broadcasters Association, Allen B. DuMont Laboratories, CBS, NBC, Westinghouse Electric Corporation, Cowles Broadcasting Company, Eitel-McCullough, Inc., Television California, Inc., Twentieth Century-Fox Film Corporation, G. A. Richards stations (WJR, Detroit, WGAR, Cleveland and KMPC, Hollywood).*

Westinghouse has prepared an extensive report on its "Stratovision" program for the hearings. In a previous session, a 475-page review of the test results of the system operating on 1107.5 and 514 megacycles was offered. The report revealed that the airborne telecasts provided reception at points several hundred miles away from the station. As a result of these performances *Westinghouse* filed an application for channel 8 to operate about a point 30 miles west of Pittsburgh and provide a service in an area with a radius of approximately 200 miles.

According to the petition, the "Stratovision" station would provide

service to 8,253,000 people in the 58,200 square miles encompassed by the station's 5000 microvolt contour line. (FCC regulations protect ground television channels from interference by other stations, protection extending to a rough circle around the station known as its 5000 microvolt contour line.)

The "Stratovision" plane would pick up signals from KDKA to provide the new service, the application disclosed.

The tropospheric interference probe, the subject of another FCC session, will also provide significant data and indicate whether present power and antenna height restrictions should be changed and whether protected contours should be revised.

During allocation sessions in the summer, T. T. Goldsmith, Jr., director of research of *Allen B. DuMont Laboratories*, revealed that the troposphere and distance in television reception were extremely relevant factors. Tests disclosed that waves may be trapped between two boundaries of a dense layer of air which occurs a short distance above the earth's surface, producing in effect a parallel plane waveguide, and the energy, instead of being uniformly radiated in all directions, is confined and guided along close to the surface of the earth. This condition may result in the signal strength at a distant point being many times greater than that predicted by the ground wave theory alone. These effects occur more or less at random and cannot be relied upon for any dependable service, but they create a serious interference problem. Accordingly, said Dr. Goldsmith, stations will have to be separated considerably further than would be indicated by a consideration of ground wave theory alone.

In calling the interference hearing, FCC admitted that the present standards do not include specific data on tropospheric propagation, and that the results described by industry experts confirm the studies made by the Commission's Bureau of Engineering. So, it appears as if an interesting and vital decision on the troposphere and television interference will be on the books very soon!

TV RECEIVER PRODUCTION continues to climb, with over 334,000 sets having been made since January.

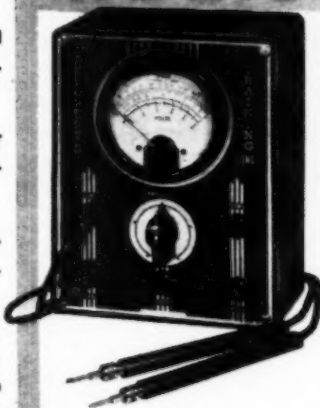
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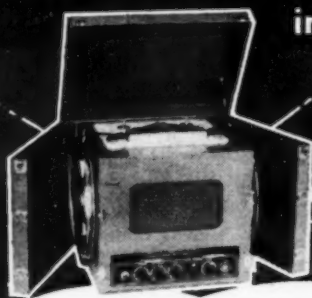
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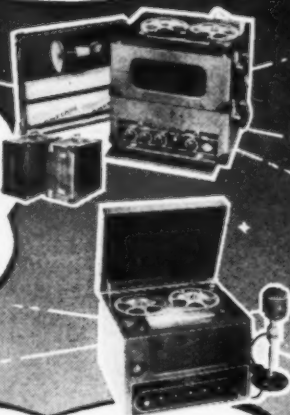
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Monthly production has been doubled since the first of the year, 30,001 sight and sound models having come off the line then, while over 64,000 units were made in June. And according to industry and trade association expert predictions, the winter months will probably see a doubling of June production.

ARCHITECTURAL REGULATIONS have now been extended to the television antenna scene. In San Diego, California, the City Planning Commission ruled recently that the heights of residential television antenna masts in the city's 29 architectural control districts will be limited to 50 feet above ground level. Five types of masts were approved for these zones. The only exception to the 50-foot rule was allowed to hotels, apartment houses and business buildings, where a 12-foot mast could be erected atop the roofs.

PICTURE TUBE RECORDING TRANSCRIPTION service will be used by most of the television stations in the Midwest during the coming months. With these packaged films, which will be flown to the telecasters, it will be possible to air the important large production shows put on in the East or Pacific Coast, shortly after the live presentations.

Four stations in Chicago which expect to use the picture transcriptions are WENR-TV (ABC), WNBQ (NBC), WBKB (independent which will carry CBS and perhaps DuMont programs) and WGN-TV (independent which will carry DuMont programs).

The transcription service will be found particularly handy until complete coax and microwave facilities are available. And even with the link facilities in full swing, schedule problems will make it necessary to use the films for delayed type telecasts, just as broadcasters use disc and tape recordings for delayed broadcasts.

As a result of the accelerated interest in this new mode of transcription, film and television specialists are burning the midnight oil developing improvements in equipment and materials which will bring more and more fidelity to the transcribed images.

THE FCC RECORDS reveal that many television networks are being planned, particularly in the Far West areas. In Texas, for instance, a Texas Telenet System, with stations in Austin, San Antonio, and Corpus Christi, is now on the drawing board. Microwave links, 30 to 40 miles away, are scheduled to be used to tie in the cities, which may eventually also include Waco, Fort Worth, Dallas, Houston, Wichita Falls, etc.

IT'S BLACK AND WHITE TV for the British, too. A decision by the television committee of the British Broadcasting Corporation states that

(Continued on page 144)

RADIO & TELEVISION NEWS

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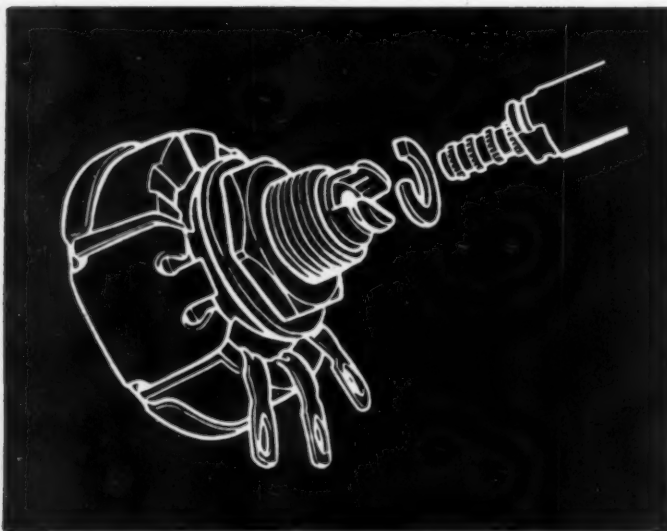
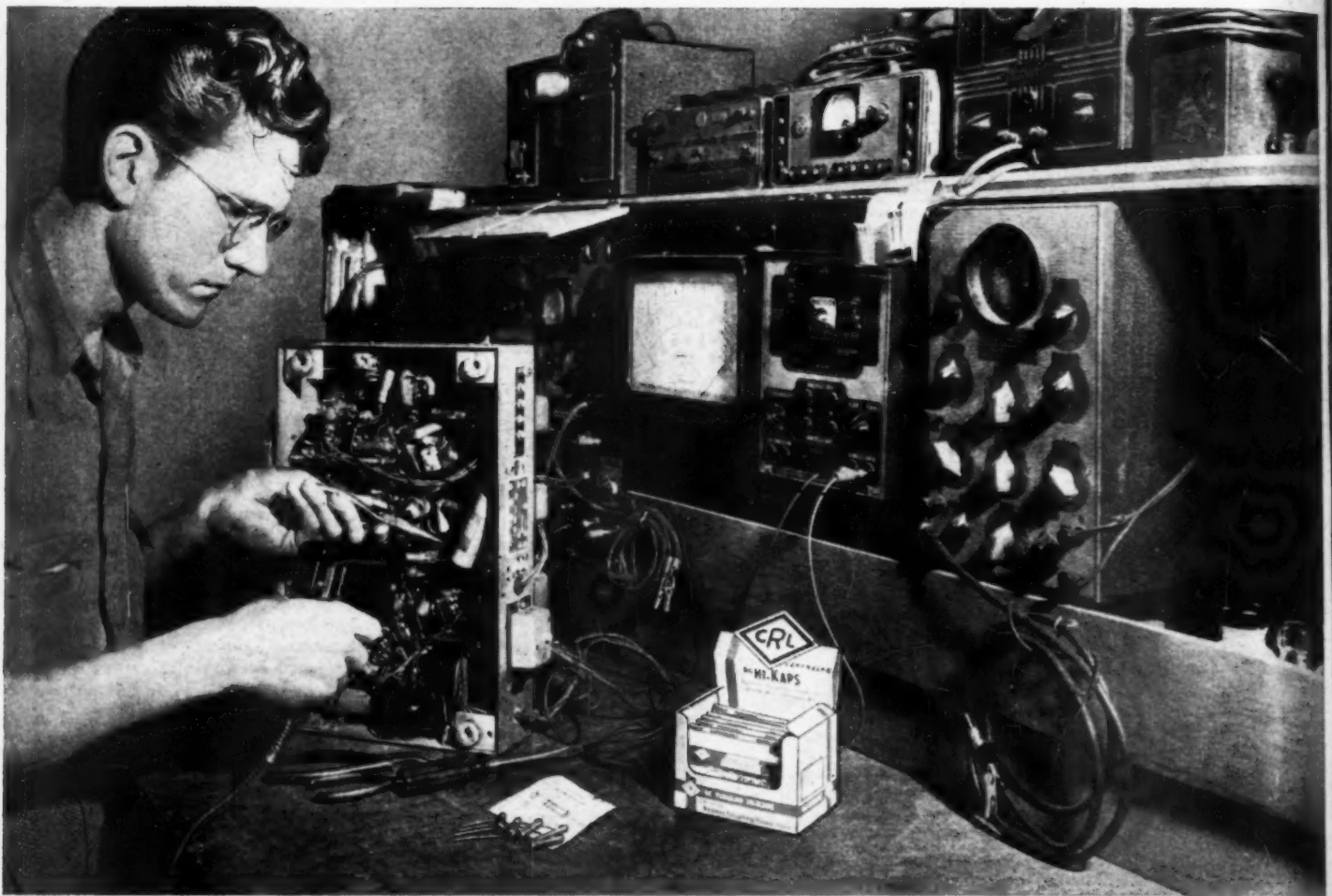
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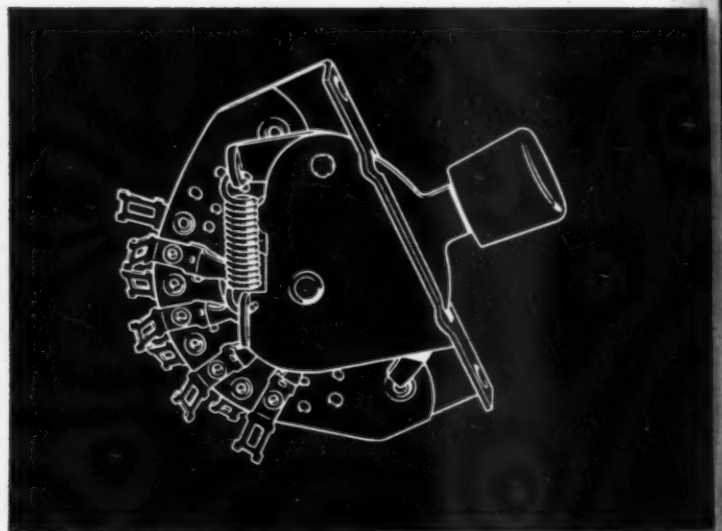
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Controls: With CRL's improved *Adashaft* Radiohms you can carry a small stock of controls, yet be ready to handle almost any kind of control replacement problem. No wiggle, no wobble, no slip. Just insert shaft pilot in control stub shaft, and slip "C" washer into place. Available in all sizes for all model "M" volume control applications. Six types of shafts.

20



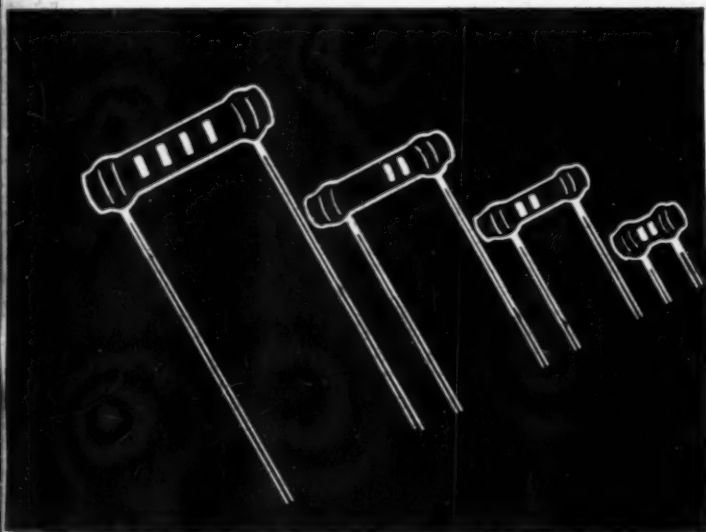
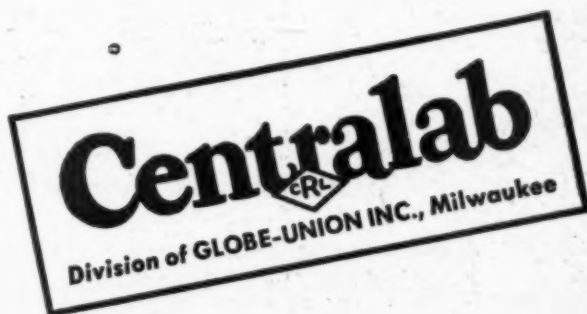
Switches: Centralab offers you a complete line of Tone, Rotary Selector, Lever Action and Medium Duty Power Switches, which features a wide variety in both laminated phenolic and steatite insulation. Available with shorting or non-shortng contacts. See your Centralab Distributor for further information, or write direct for new Catalog 26.

RADIO & TELEVISION NEWS

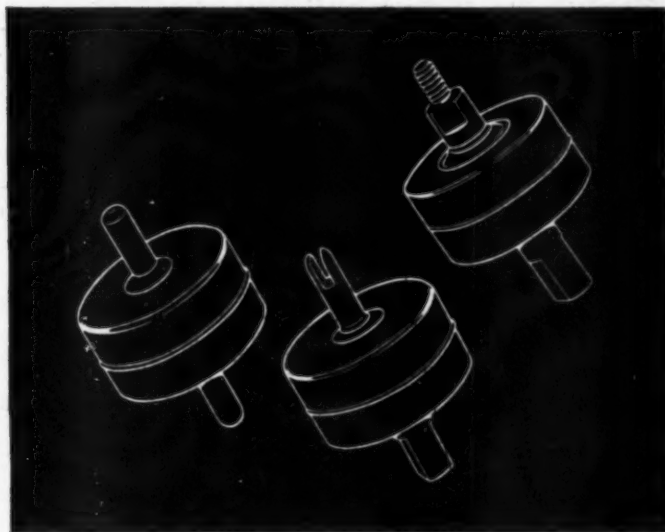
boosts your profit

Faster service . . . satisfied customers . . . greater profits go hand in hand when you switch to Centralab replacement parts. CRL components are easy to use — speed repairs. They're easy to stock—cut overhead. They won't let you down — build repeat business. When you compare quality, performance and price, you'll see why radio servicemen everywhere use Centralab parts to increase efficiency in their shops . . . build customer goodwill . . . put extra dollars in their pockets. Find out how the Centralab line can help you build up your service business. For the complete story, get in touch with your Centralab Distributor.

← — "Centralab's line of replacement parts cuts repair time in our shop", says Earl Olson, serviceman for Pohl Radio Service, Wauwatosa, Wisconsin. "This makes it possible to turn out more work every day."



"Hi-Kaps": CRL line of ceramic By-pass and Coupling Capacitors gives you ceramic dependability and permanence at a new low price! Packaged in a convenient envelope of five, *Hi-Kaps* are clean, easy to stock and handle. Wide range from .000050 to .010000 mfd. Rating — 600 WVDC, 1000 V. flash tested. Ask your Centralab Distributor for all the facts.
November, 1948

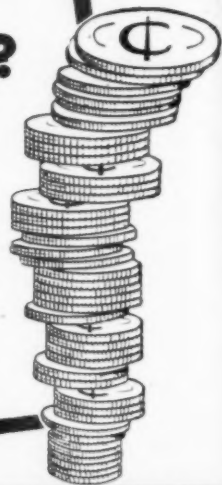


"Hi-Vo-Kaps": Just out! Centralab's new high voltage capacitors for television and high voltage applications. Made of Ceramic-X, *Hi-Vo-Kaps* combine high voltage and small size to give you convenient, dependable performance, 10,000 WVDC flash, 20,000 VDC. Capacity — 500 mmf. See your CRL Distributor, or write direct.

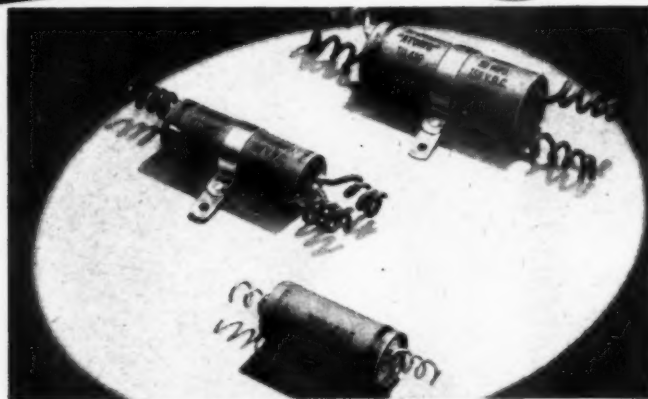
Why play "PENNY-ANTE"... when your business is at stake?

A good reputation, like good-will, is built by many deeds, but may be destroyed by a single dissatisfied customer. Your reputation is too valuable to risk for the few pennies "saved"

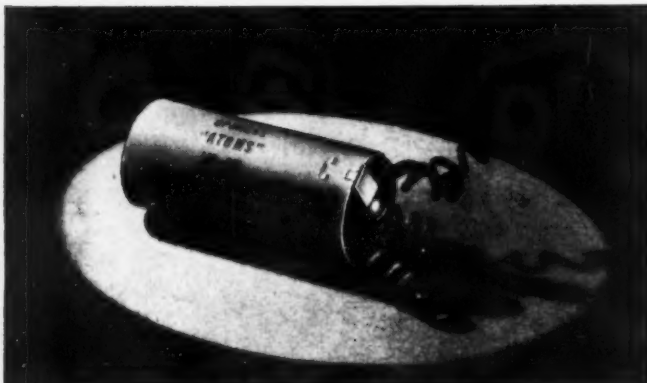
by buying inferior or unknown "bargains." That's why we keep repeating "Your Reputation and your customers deserve the best!" And the best means Sprague.



SPRAGUE TM TUBULARS—The first truly practical MOLDED Paper Tubular Capacitors!



SPRAGUE ATOMS—Universal Midget Dry Electrolytics!



SPRAGUE LM—Universal Mounting Replacements!



SPRAGUE EL—Self-Mounting Midget Can Type!



Reach for a **SPRAGUE**
and Know You're Right!

THESE SPRAGUE PRODUCTS ARE UNCONDITIONALLY GUARANTEED!

When used at their capacitance and voltage ratings, these Sprague Products are unconditionally guaranteed to render satisfactory performance.

CAPACITORS

*KOOLOHM
RESISTORS

SPRAGUE

*T.M. Reg.
U.S. Pat. Off.

SPRAGUE PRODUCTS COMPANY, North Adams, Mass.
(JOBGING AND DISTRIBUTING ORGANIZATION FOR THE PRODUCTS OF THE SPRAGUE ELECTRIC COMPANY)

RADIO & TELEVISION NEWS



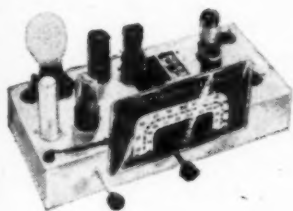
RADIO

Let **NATIONAL SCHOOLS**, of Los Angeles, a practical Technical Resident Trade School for almost 50 years, train you for today's unlimited opportunities in Radio

Good Jobs Await the Trained Radio Technician

You are needed in the great, modern Radio, Television and Electronics industry! Trained Radio technicians are in constant and growing demand at excellent pay—in Broadcasting, Communications, Television, Radar, Research Laboratories, Home Radio Service, etc. National Schools Master Shop Method Home Study Course, with newly added lessons and equipment, can train you in your spare time, right in your own home, for these exciting opportunities. Our method has been proved by the remarkable success of National Schools-trained men all over the world.

You Learn by Building Equipment with Standard Radio Parts We Send You



Your National Schools Course includes not only basic theory, but practical training as well—you learn by doing. We send you complete standard equipment of professional quality for building various experimental and test units. You advance step by step until you are able to build the modern superheterodyne receiver shown above, which is yours to keep and enjoy. You perform more than 100 experiments—build many types of circuits, signal generator, low power radio transmitter, audio oscillator, and other units. The Free Books shown above tell you more about it—send for them today!

NOW! New Professional Multitester Included!



This versatile testing instrument is portable and complete with test leads and batteries. Simple to operate, accurate and dependable. You will be able to quickly locate trouble and adjust the most delicate circuits. You can use the Multitester at home or on service calls. It is designed to measure AC and DC volts, current, resistance and decibels. You will be proud to own and use this valuable professional instrument.



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National Schools Master Shop Method Home Training gives you basic and advanced instruction in all phases of Radio, Television and Electronics. Each lesson is made easy to understand by numerous illustrations and diagrams. All instruction material has been developed and tested in our own shops and laboratories, under the supervision of our own engineers and instructors. A free sample lesson is yours upon request—use the coupon below.

You Get This and Other Valuable Information in the Free Sample Lesson:

1. Basic Receiver Circuits and How They Are Used.
2. Construction of the Antenna Circuit.
3. How Energy Is Picked Up by the Aerial.
4. How Signal Currents Are Converted into Sound.
5. How the Tuning Condenser Operates.
6. How the R-F Transformer Handles the Signal and other data, with diagrams and illustrations.

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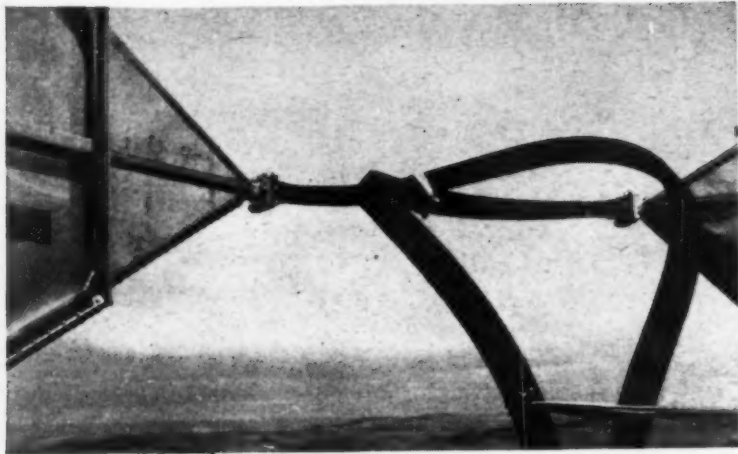
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4004 S. Figueroa, Los Angeles 37, Calif.

Mail me **FREE** the books mentioned in your ad including a sample lesson of your course. I understand no salesman will call on me.

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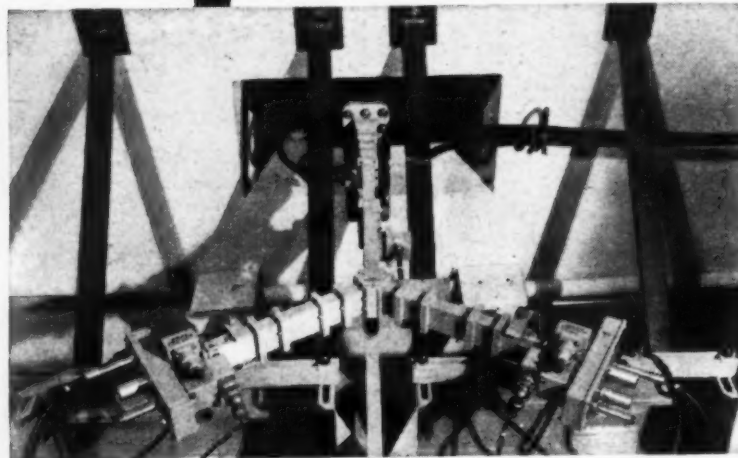
ADDRESS

CITY HOME STATE



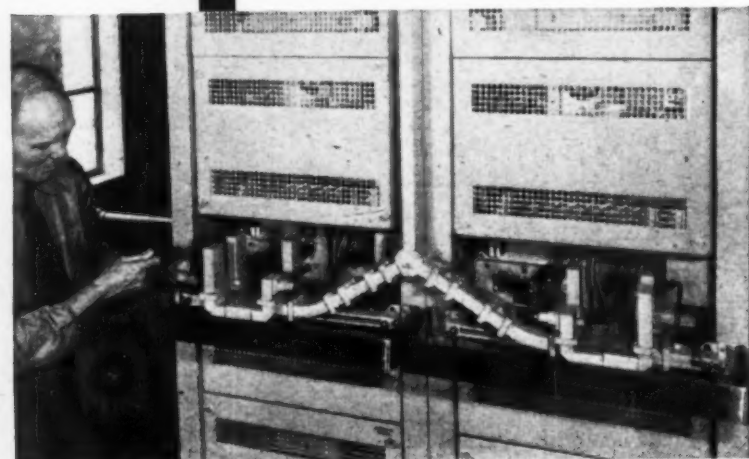
3

The waveguide connects with antennas, which are oriented in azimuth with antennas at next station. At right is complete repeater station.



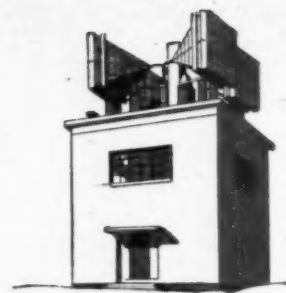
2

The waveguide continues upward through the roof of the station toward the antennas.



1

Base of a waveguide circuit in a repeater station of the New York-Boston radio relay system.



Pipe Circuits

UNLIKE radio broadcast waves, microwaves are too short to be handled effectively in wire circuits. So, for carrying microwaves to and from antennas, Bell Laboratories scientists have developed circuits in "pipes," or waveguides.

Although the waves travel in the space within the waveguides, still they are influenced by those characteristics which are common to wire circuits, such as capacitance and inductance. A screw through the guide wall acts like a capacitor; a rod across the inside, like an inductance coil. Thus transformers, wave filters, resonant circuits — all have their counterpart in waveguide fittings. Such fittings, together with the connection sections of waveguide, constitute a waveguide circuit.

From Bell Laboratories research came the waveguide circuits which carry radio waves between apparatus and antennas of the New York-Boston radio relay system. As in long distance wire communication, the aim is to transmit wide frequency bands with high efficiency — band widths which some day can be expanded to carry thousands of telephone conversations and many television pictures.

Practical aspects of waveguides were demonstrated by Bell Telephone Laboratories back in 1932. Steady exploration in new fields, years ahead of commercial use, continues to keep your telephone system the most advanced in the world.

BELL TELEPHONE LABORATORIES

EXPLORING AND INVENTING, DEVISING AND PERFECTING FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE.

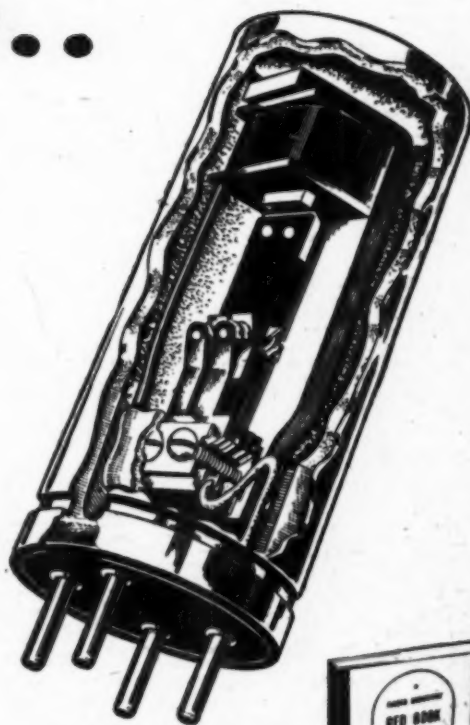


RADIO & TELEVISION NEWS



Guiding Light..

The beacon light that lends a guiding hand to ships at sea is the sailors best friend. And so it has been true over the years of the RADIART VIBRATOR catalog! Carefully edited . . . skillfully planned . . . this catalog manual has been of infinite help to servicemen everywhere! For the invaluable technical data . . . the carefully cataloged listings . . . these have been the source of information that radio men depend upon. We are proud to help the trade in this manner, and will continue to print a catalog that will be regarded as "the bible of the industry".



THE ONLY VIBRATOR LINE
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useless testing
on 4 jobs out of 5

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MODERN RADIO SERVICING

A complete guide to trouble-
shooting, instruments, circuit
analysis, repair.

LEARN TO WORK BY MODERN, PROFESSIONAL METHODS

1 Train for the big pay jobs!

Ghirardi's MODERN RADIO SERVICING is a complete, 1 vol. course in all phases of professional radio-electronic repair. Tells how to make preliminary trouble checks on difficult jobs; how to analyze any circuit and its components; how, when and where to use all types of test instruments and interpret their readings to track down the trouble—even how to start a service business of your own. Everything is explained simply and thoroughly. 706, clear illustrations and 723 self-test review questions make study easy. Complete 1300-page book only \$5—or see special combination price offer below.

CUT TIME IN HALF ON COMMON SERVICE JOBS

2 Work faster—make more money

Almost 4 out of 5 radio repair jobs can be handled as easily as falling off a log! Just look up the model of the set to be fixed. Chances are Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK tells exactly what the trouble is, exactly how to fix it. Gives common troubles, their symptoms and remedies for over 4800 radios by 202 manufacturers. Hundreds of additional pages contain tube data; transformer trouble listings, alignment charts, and dozens of diagrams, etc., for faster, better service on any radio ever made. Only \$5—or see special combination offer.

MONEY-SAVING OFFER!

Let Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK save time, help you make more money on common service jobs. Let MODERN RADIO SERVICING train you in truly scientific servicing that can pave your way to the big money jobs. Get BOTH big books at the special price of only \$9.50 for the two (\$10.50 foreign). Use coupon today—at our risk!

**NOW!
READ THESE
GIANT
BOOKS
FOR 10 DAYS
at our risk!**

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232 Madison Ave., New York 16, N. Y.

Send me the books checked below for 10-days examination on approval. In 10 days I will pay for the books, plus a few cents postage, or return them postpaid. (Postage paid on cash orders; same return privilege. Books sent on approval in U. S. only.)

☐ MODERN RADIO SERVICING \$5 (\$5.50 outside U.S.A.)

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☐ SPECIAL MONEY-SAVING OFFER—Both of above big books only \$9.50 (\$10.50 outside U.S.A.)

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Address.....

City, Zone, State.....



ALLEN B. DUMONT LABORATORIES, INC. has moved the Television Receiver Sales Division of the company to new and enlarged quarters at DuMont's 515 Madison Avenue, New York headquarters.

The division which was formerly located in a section of the second floor now occupies the entire 41st story of the building.

Until quarters have been completed, the receiver showroom and offices of service technicians will remain at their second floor locations.

JAY C. FONDA, nationally known sound recording engineer, has joined the Morris F. Taylor Company, manufacturers' representatives of Silver Spring, Maryland.



Mr. Fonda has relinquished his private engineering consultant practice to join the Taylor organization where he will serve as sales engineer calling on industrial plants in eastern Pennsylvania, Delaware, and southern New Jersey.

Mr. Fonda formerly headed Fonda Sound Corporation, was vice-president and director of engineering of Fonda Corporation and president and chief engineer of Jay C. Fonda, Incorporated. He has also held the position of chief engineer with Jefferson-Travis Radio Company.

LUND-HANSEN COMPANY has been recently organized in Chicago to represent the electronic parts manufacturers who prior to the formation of the new company were represented by Ralph T. Brengle Sales Company.

The Brengle organization will devote full time to national sales for Potter & Brumfield Mfg. Co. and Montgomery Mfg. Co. The new organization will handle the lines of Precision Apparatus, University Loudspeakers, Marion Electrical Instrument, Premax Products, Special Products Co. in addition to representing Potter & Brumfield and Montgomery locally.

Principals in the new firm are Russell Lund and Dudley Hansen, both of whom have been handling sales for the Brengle organization for the past several years. Mr. Lund held positions with Raytheon, Clough-Brengle, and Thordarson before joining Brengle. Mr. Hansen was in the Engineering Department of Admiral Corporation and was, prior to that time, associated with Grigsby-Grunow.

Lund-Hansen Company is sharing

offices with Ralph T. Brengle Sales Company at 549 West Washington Boulevard, Chicago.

BERT COLE, vice-president and general manager of Crosley Distributing Corporation, has been elected to the board of directors of the corporation.

The announcement followed a recent disclosure by Mr. Cole that the 1948 sales volume of the New York outlet for the Crosley Division, Avco Manufacturing Corporation was the highest in its history and more than double the volume attained during a similar period last year.

The Crosley Distributing Corporation handles Crosley radio and television receivers and the company's line of home appliances. Executive offices and display rooms are located at 1775 Broadway in New York.

BENDIX RADIO has announced the appointment of four district merchandisers to complete its radio and television sales organization.

W. J. Lancaster, who maintains offices at 16 Beale Street, San Francisco, will cover the entire Northern California territory.

James V. Cunningham, operating as the Telerad Sales Co., 30 Huntington Avenue, Boston, is the new district merchandiser for Eastern Massachusetts and Rhode Island.

Western Massachusetts will be covered by Louis Del Padre, 1162 River Road, Agawam, Massachusetts.

The second western appointment named Roy P. Mulhausen, operating as the Nelfram Co., 702 Ernest and Cramer Building, Denver, to cover that territory for Bendix.

E. H. FRITSCHER has been named manager of sales for the Industrial and Transmitting Tube Division of the General Electric Tube Division at Schenectady.



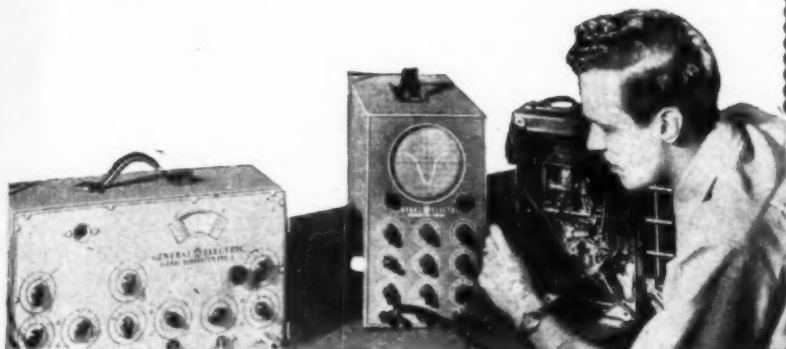
Mr. Fritschel graduated from Iowa State in 1926 with a B.S. degree in electrical engineering and immediately joined General Electric Company as a student engineer on the test course. In April 1927, he went to Uruguay as a construction foreman for the installation of radio transmitting equipment, later doing development work at Schenectady.

In March 1929 he was transferred to the Radio (now Electronics) Department where he has handled radio transmitter and industrial electronic

A Sensational Announcement to the "Top Third" of the Servicing Field!

Now, after two years of preparation, CREI introduces its new home study course in

TELEVISION AND FM SERVICING



G. E. PHOTO

100% Practical "On-the-Job" Course That Equips You to Install and Service ALL Types of Television and FM Receivers

This is the big changeover year—from radio to television.

It is the year for you and all servicemen to make the big decision. Either you are going to catch up with the new developments in the industry, or you are going to be passed by. There are new techniques—entirely new methods of technical "know how" to be learned and mastered, if you are going to be in a position to handle good-paying Television and FM business.

This new course was prepared by CREI at the request of several large manufacturers, distributors and dealers who said, "We must have more servicemen trained to handle the approximately 800,000 television sets and 4,000,000 FM sets to be produced this year alone!" CREI knows exactly what you need and every effort has been made to keep this course practical and to the point. If you are now in service work you will be able to thoroughly understand and apply each lesson. It has been reviewed and checked by qualified service experts who know what *you must know* to get ahead in this booming field.

Radio Service Division of

CAPITOL RADIO ENGINEERING INSTITUTE

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**MAIL
TODAY**

CREI has never attempted "high pressure" selling of any kind. In introducing this course, we believe honestly that it can provide you with the ability you must have to hold your job—qualify for a better one—or start your own business.

To such familiar service terms as "tone, selectivity, circuit noise, AVC, feedback, etc.," must be added such terms as, "dipole, rasters, clippers, clamping circuits, synch pulses, blanking pedestals, etc." Do you understand this new language? Are you qualified to install and service all types of Television and FM Receivers?



TV and FM will make more progress in the next 10 months than they have in the past 10 years. Just think of the extraordinary opportunities this opens up for you. Here in one practical course at a popular price, CREI offers you security and more money.



Don't put it off. Get going now and get in on the big money that is going to be made by those men who have equipped themselves to handle the "sets of tomorrow."

Start your training now and you start applying your new-found knowledge immediately. Every lesson in this course can be helpful in your daily work. As you progress in your training you will find yourself equipped to handle complicated Television and FM work that only a few months ago looked "impossible". The time to start is now.

It costs you nothing but a few minutes time to read the interesting facts and the complete lesson-by-lesson outline. So practical, so simple to understand. Mail the coupon now for complete information.

CAPITOL RADIO ENGINEERING INSTITUTE
16th & Park Road, N. W., Dept. 4118, Washington 10, D. C.

Gentlemen:

Please send me complete details of your new home study course in Television and FM Servicing. I am attaching a brief resume of my experience, education and present position.

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☐ I AM ENTITLED TO TRAINING UNDER G. I. BILL



The New RAYTHEON BANTAL TUBE

It's Easier to STOCK

At the same price as ordinary tubes one Raytheon Bantal takes the place of two—cuts your stock problem in half! The Bantal 12SK7GT, for ex-

ample, replaces, without shielding, either the GT or metal equivalent. Fast turnover, less money tied up in stock, more profit on your investment.

It's Easier to SELL

All these advantages at NO EXTRA COST

Rugged Eight-Pillar Construction — Short pillars direct to elements: low grid-plate capacitance—greater stability.

Completely Shielded Internally — No external shielding hardware or installation labor. Increases your service profit.

Glass Button Stem — Low Loss.

Gloss-To-Glass Seal — Permanent Vacuum.

Wide Lead Spacing — No Electrical Leakage.

Strong Non-Flexible Leads — No Base Shorts.

Glass-To-Dumet Vacuum Seal — No Air Leaks.

EIGHT POPULAR TYPES — 6SA7GT — 6SJ7GT — 6SK7GT — 6SQ7GT — 12SA7GT — 12SJ7GT — 12SK7GT — 12SQ7GT.

SUPERIOR FOR HEAVY DUTY SERVICE — Recommend Raytheon Bantals particularly for replacements in sets or equipments requiring tubes of long life and greater dependability. Their superior performance assures customer satisfaction and repeat business.



*Your Raytheon Distributor sponsors the famous Bonded Dealer-Service Program. Ask him for full details on this business building plan.

tube sales. Prior to his new appointment he was manager of sales for the Tube Division.

GENERAL TELEVISION CORPORATION has changed its corporate name to *Starrett Television Manufacturing Corporation*. The change has been made to avoid an inadvertent conflict with the name of an Illinois corporation which is no longer in business.

The company will continue to manufacture its complete line of television receiving sets at its factory, 601 West 26th Street, New York.

The company also announced the opening of a showroom for the display of its receiving sets to dealers at 521 Fifth Avenue, New York.

WILLIAM F. ANDERSON has recently been named director of sales for *Super Electric Products Corporation* of Jersey City, manufacturers of a line of r.f. and i.f. power transformers and radio and television components.



Mr. Anderson was formerly co-owner of *Utility Sales Associates* of New York City, manufacturers' representatives and brokers in electrical and steel products.

During the war he was district manager of the New York Production Field Office of the Signal Corps and for twenty years before the war was associated with the *Frigidaire Division* of *General Motors Corporation*.

G. V. BUREAU has joined the *Power Tube Division* of *Amperex Electronic Corporation* of Brooklyn, New York.

Mr. Bureau was formerly associated with the *Cathode-Ray Tube Division* of *North American Philips Company, Inc.* of New York and had previously been connected with *National Union Radio Corporation* and other electronic firms.

KURT EMDE, chief mechanical engineer of the Household Radio Division of *Zenith Radio Corporation*, died recently at the company's plant in Chicago.

Mr. Emde was born in Germany and received his education in schools and colleges in that country. He joined *Zenith* in 1934 as a mechanical designer, and was named chief mechanical engineer of the company a short time later. He was a member of the *Chicago Technical Society* and was widely recognized throughout the radio industry for numerous mechanical engineering and design developments and improvements.

ADMIRAL CORPORATION has announced the formation of an International Division to handle the marketing activities of *Admiral* products outside the continental United States and Canada.

Heading the new division is George
(Continued on page 132)

RADIO & TELEVISION NEWS

Tube Testers for Today and Tomorrow... SPECIFY **TRIPLETT**

UP and DOWN

Lever Switching Connects Each Tube Pin to Proper Circuit

1. ALL ELEMENT CHECK — Thorough conclusive test of tube elements, shields and taps. The only commercial tester to get at each tube pin and make an open and short check.

2. NO HUNTING FOR SOCKETS — No plugging into wrong socket. Circuit flexibility requires only one socket for each type of tube base.

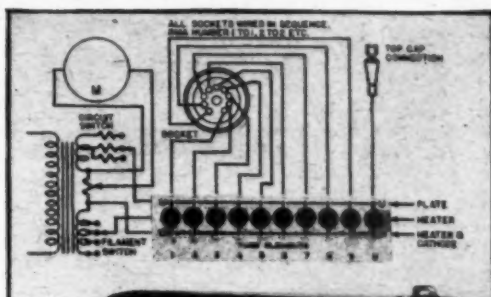
3. CIRCUIT CLARITY — Lever switch numbering corresponds to RMA tube pin numbers, connected to bring out each active tube element. A simple up or down motion of the lever instantly makes the connection.

4. OPERATION SIMPLICITY — Minimum of control settings plus straightforward arrangement of this outstanding emission circuit. Generally not more than five of the 10 lever switches need be set.

5. "PICTURE" YOUR CIRCUIT — Assures confidence in tests and enables special tube checks for balanced circuits, special loads, etc. "Trick" switching circuits make it more difficult for the serviceman to "picture" his test circuit.

6. SET UP YOUR OWN TEST FOR NEW TUBES — The "pictured" circuit and straightforward test procedures enable the user to set up data for new tubes. A feature rarely found in commercial type tube testers.

7. INDIVIDUAL CONTROL FOR EACH TUBE ELEMENT — Takes care of roaming elements, dual cathode structures, multi-purpose tubes, etc., in addition to standard value tests.



TUBE TESTER MODEL 3413

Triplett lever switching circuit arrangement has 7 distinct advantages contributing to maximum flexibility, simplicity of operation and anti-obsolence.

**NET DEALER \$66⁷⁵
PRICE**



... Combination

Volt-Ohm-Mil-Ammeter Model 3480

This tester combines the Tube Tester Model 3413 with complete facilities for voltage current and resistance analyses . . . a real economy for those shops requiring a combination tube tester and volt-ohm-mil-ammeter . . . Attractive two tone metal case with detachable hinged cover . . .

TECH DATA

D. C. Volts: 0-3-12-60-300-1200, at 10,000 Ohms/Volt.
A. C. Volts: 0-3-12-60-300-1200, at 2,000 Ohms/Volt.
D. C. Amps: 0-12, at 250 Millivolts.
D. C. Milliamps: 0-1.2-12-120, at 250 Millivolts.
Ohms: 0-1000-10,000 (10-100 at center scale).
Megohms: 0-1-50 (10,000-500,000 Ohms center scale).
Output: Output Jacks, Condenser in series with A. C. Volt ranges.
Scale: 5.6" long on top scale arc. 0-1000 Ohms and 0-50 Megohms on top arc.
0-12-60-300 A. C. and D. C. Volt figures are on four separate arcs. Scale markings are black on white except A. C. are red on white; 0-1K Ohms scale is green on white.



MODEL 3480 \$98⁷⁵ . . . U.S.A. Dealer Net

SEE AT YOUR RADIO PARTS DISTRIBUTOR OR FOR MORE INFORMATION . . . WRITE

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Precision first...to Last



RIGHT.... FOR MODERN CIRCUIT DESIGNS

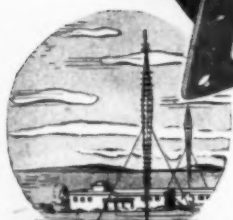
The Chicago Transformer New Equipment Line

Chicago Transformer's *New Equipment Line* fills an urgent need in the electronics fields for transformers designed exclusively to fit up-to-date circuit requirements. Here's why . . .

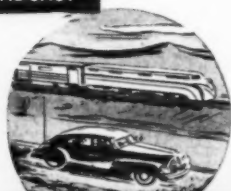
1. *Voltage and Current Ratings* of C.T. *New Equipment* Power Transformers have been selected to conform closely to the plate and filament loads of the tubes most widely used today. These units are conservatively rated . . . will deliver their full output with temperature rise well within RMA-recommended standards.
2. *Line and Voice Coil Impedances* of C.T. *New Equipment* Audio Transformers fit the accepted industry practice of standardized 600 and 150-ohm line impedances; 16, 8, and 4-ohm speakers.
3. *High Fidelity at Full Rated Output.* Frequency response within $\pm 1/2$ db for virtually all output and input transformers, within ± 1 db for all driver and modulation transformers, is guaranteed. Recommended frequency ranges fit three fields of general use — 30 to 15,000 cycles, 50 to 10,000 cycles, and 200 to 3,500 cycles.

Add to these features the sleek, modern appearance and compactness of C.T.'s outstanding drawn steel case constructions—in two alternate base styles as illustrated—and you have the reasons why this is *the only transformer line of its kind!*

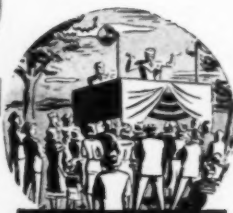
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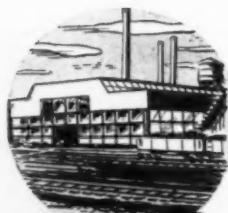
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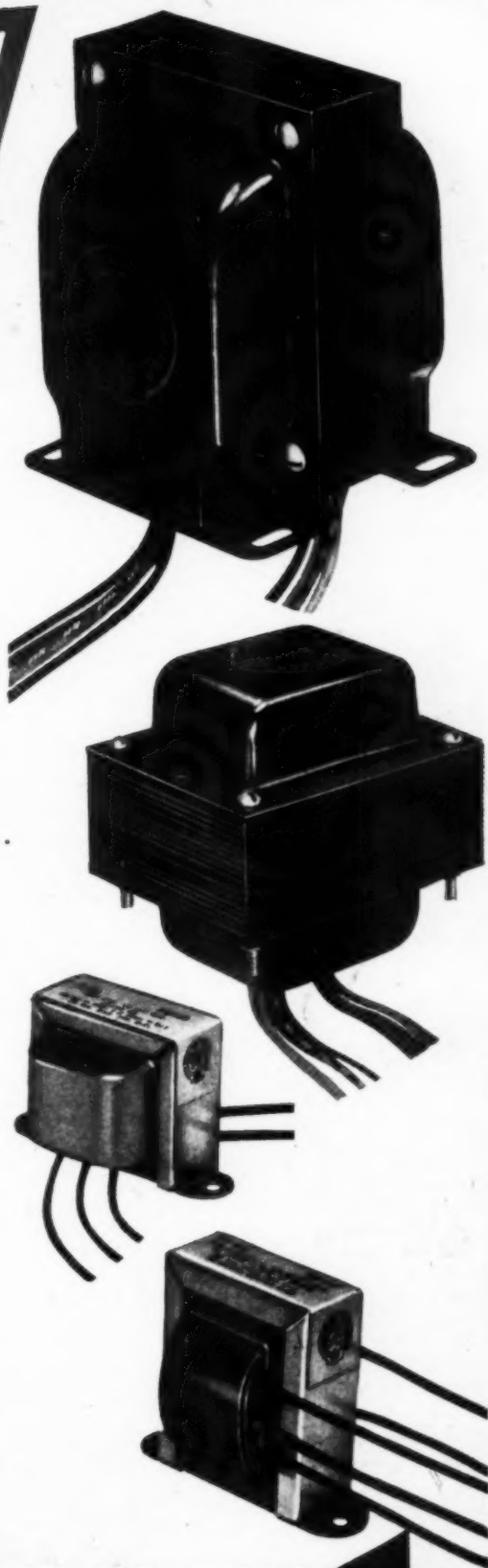
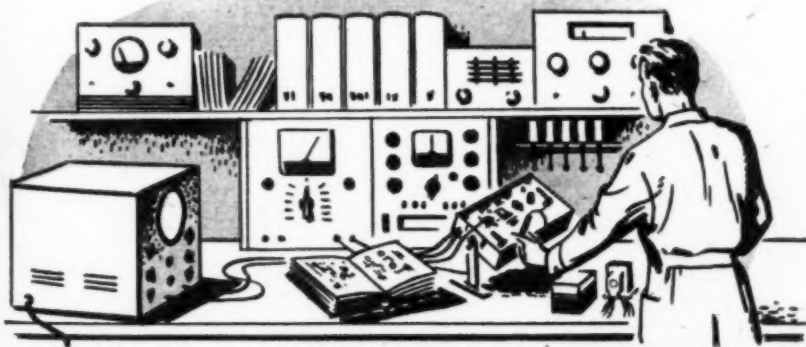
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MICROWAVES for Relaying TV Programs

By
SAMUEL FREEDMAN
DeMornay Budd Inc.

An up-to-date survey of the projected and existing relay facilities for network transmission of television.

THE writer has just completed a comprehensive survey of the microwave relay field as used for the transmission of television between various cities. It has been undertaken with the excellent cooperation of Bell Telephone Laboratories, American Telephone and Telegraph Company, DeMornay Budd Incorporated, National Broadcasting Company, Columbia Broadcasting System, Allen B. DuMont Laboratories, Inc., General Electric Company, and the Western Union Telegraph Company. All of these organizations are currently making use of microwaves for television relaying with or without connecting coaxial cables.

While the use of microwaves for television relaying is still in its infancy, it already is serving over a tenth of our population area. Its utilization to date despite the experimental nature and relatively early design of equipment, leaves no doubt in the mind of any television broadcaster as to its practicability and increasing utilization. Systems are already in operation in various parts of the ultra- and super-high-frequency spectrums between 900 and 7000 megacycles.

The principal systems which have actually been operating during the unprecedented growth of television during 1948 are:

A. The Bell system operated by the Long Lines Department of the American Telephone and Telegraph Company between New York and Boston with seven intermediate repeater-booster stations. It ties in at New York with coaxial cable to Washington, D.C. It has been sufficiently promising to justify immediate expansion of the system to Chicago as the next major step. For this purpose, 31 intermediate radio repeater-booster stations will be required. It will be completed, in late 1949 or early 1950.

B. The Philco microwave relay system between New York and Philadelphia on 1370 and 1410 megacycles operated as part of the NBC television relay system between New York and Washington. Beyond Wyndmoor, Pa. it becomes the RCA/NBC system oper-

ating on approximately 7000 megacycles.

C. The General Electric system on approximately 2000 megacycles extending from New York City to Schenectady, N.Y. in one direction only.

D. The Western Union Telegraph Company microwave relay system now closing in the New York-Washington-Pittsburgh triangle and slated to next continue towards Chicago in its eventual nation-wide coverage.

E. The Raytheon system from Boston to New York undertaken experimentally and currently closed down pending further plans.

Fig. 2 shows the Bell System's coaxial cable and radio relay program as it exists at this time and as it is expected to become by 1950. While microwaves were retarded in civilian development by the high classification it held for purposes of national defense and the quest for suitable tubes to generate the necessary frequencies, coaxial cables had an opportunity to gain a foothold. At the present time, coaxial cables are being used to relay television programs wherever they are available. The American Telephone and Telegraph Company has set up a rate schedule which makes no distinction between microwave relays and coaxial cables. In fact, both may be used in the same system to bring the program to the distant radio receiver. The basic rate for leasing a single television or "video" channel is now \$35 per month per airline mile for eight consecutive hours each day and \$2 a month per airline mile for each additional consecutive hour. By the end of 1948, the Bell System expects to provide service for television program transmission so that about 40 million people will be residing in the areas which the facilities will be able to reach. Before the end of 1948, the mid-western network will be joined with the eastern network. Initially constructed in the experimental shops of the Bell Telephone Laboratories, the magnitude of the microwave relay program has made it necessary to now turn over the manufacture or production to the factories of the West-

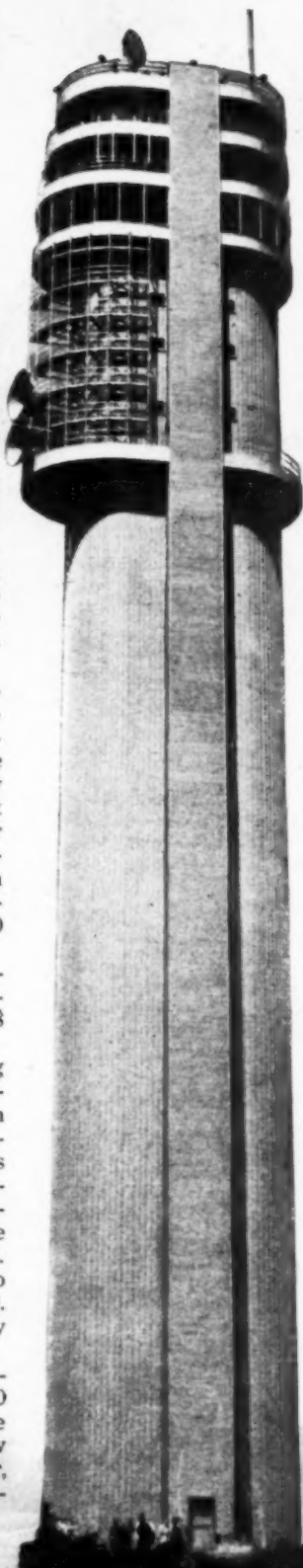


Fig. 1. The microwave antenna tower of the Federal Telecommunications Labs at Nutley, N. J.

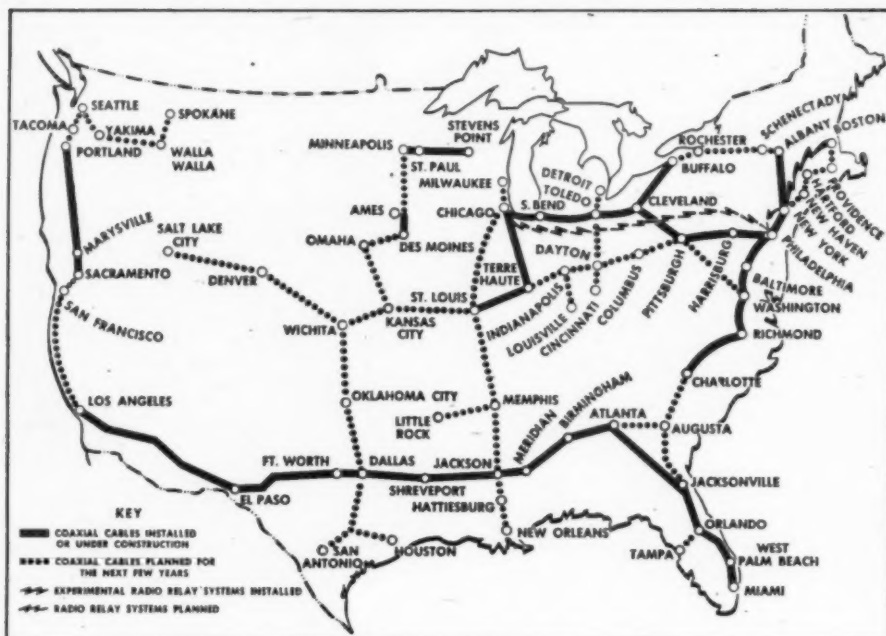


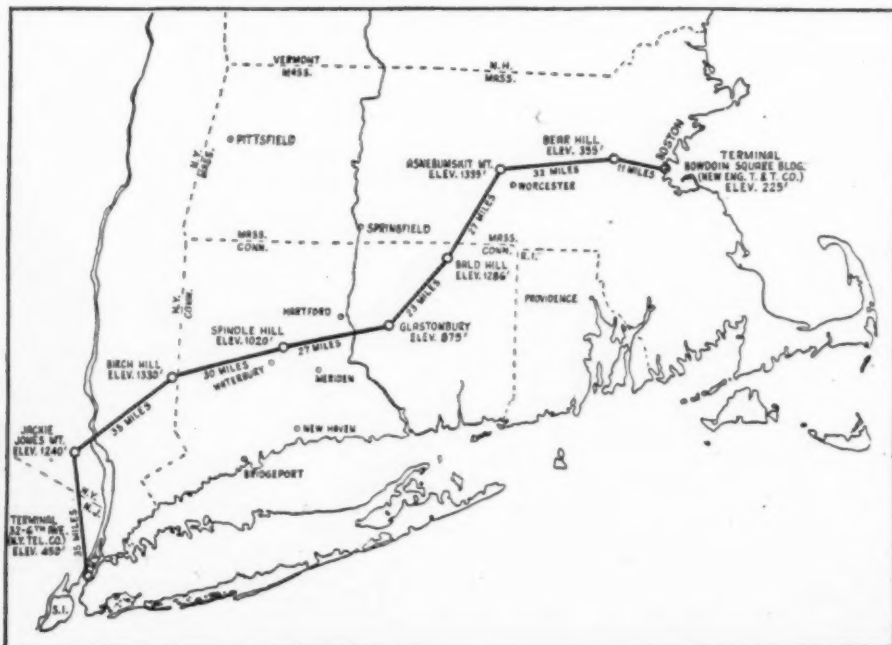
Fig. 2. The Bell System coaxial cable and radio relay routes.

ern Electric Company at Kearny, N.J. and Winston-Salem, North Carolina.

The use of coaxial cable in lieu of or in connection with a microwave relay system makes it necessary to reduce the channel-width to 2.7 megacycles. While coaxial cables are capable of handling much greater bandwidths, they can only do so by the use of more closely spaced booster stations in order to compensate for the excessive increase in attenuation with increase in bandwidth. The 2.7 megacycle channel-width represents the best compromise at present for coaxial cable transmission of television without excessive attenuation, or spacing the repeater-booster points closer than their present eight mile separations. Microwave systems, in practice, are

being spaced about 30 miles apart and are not limited in bandwidth. Widths of $4\frac{1}{2}$ to 6 megacycles are particularly convenient to provide. It will also not be too difficult a problem for microwaves to handle 20 megacycle bandwidth as color television goes into operation by such pioneering organizations as *Columbia Broadcasting System* and the *Radio Corporation of America*. At the present time, systems tying in with coaxial cable are engaging in narrower band television transmission than are systems which use microwave relay exclusively. The wider channel width is resulting in better transmission although the 2.7 megacycle channel is by no means unsatisfactory. The excellent engineering and design provisions have done

Fig. 3. Bell System's New York-Boston radio relay network.



much to offset the disadvantage of the narrower band. At the present time coaxial cable costs about a dollar a foot or about \$5000 per mile material cost. One such cable comprises eight coaxial tubes, each capable of handling a program. When the right of way, cost of laying it underground, and the cost of frequent booster stations are included, the over-all cost of construction can reach a figure as high as \$50,000 per mile as it runs rather than airline distance. It is not expected to equal that figure even for the most elaborate microwave installations. However, the cost of the Bell microwave relay system from New York to Boston may compare in cost with coaxial cable per channel because no expense was spared in the initial system. The individual buildings have cost approximately \$60,000, access roads have been built at a cost of approximately \$30,000 per station, duplicate spare bays have been provided for all equipment channels, elaborate emergency power facilities are included, along with alarm provisions for unattended operation and for complete utilities at each location. This cost can be greatly reduced per channel either by the use of less elaborate facilities or by having the same facilities accommodate additional channels of communication as the microwave relay program expands.

Fig. 9 shows the external and Fig. 8 the internal views of a typical radio relay station along the New York to Boston route. It is designed for unattended operation except for weekly inspection. On the ground floor are located the heating and air conditioning system, washroom, converter emergency power supply with bank of storage batteries and auxiliary emergency battery-driven generator. Behind a fireproof partition on the same floor, there is also provided a 20 kilowatt generator for emergency use. In the event outside power fails, there is quick emergency power of reduced amount followed by delayed emergency power of adequate amount. Within two seconds after outside power fails, the storage batteries automatically start a generator which can deliver power sufficient for the radio channel equipment only. In the meanwhile, the gas engine generator of 20 kilowatt capacity starts up and undergoes a warming-up period for stable operation requiring about eight minutes. At the end of that time, the larger generator takes over the load for the entire building in addition to the radio equipment. The battery generator then shuts off automatically. Emergency power of adequate amount can then be provided indefinitely subject only to the amount of fuel in the storage tank.

The equipment comprises four identical bays located on the second floor. These represent two channels actually operating (one in each direction) and two spare channels of identical type that can take over in the event any

channel fails to function properly.

At the New York terminus two bays are provided. At the relay stations four such bays are necessary without the local monitoring and interconnection provisions to coaxial cables. The electrical load requirement is approximately two kilowatts per bay. The spare bays are also energized so that no time need be lost in changing over. Thus, the total equipment load is about 8 kilowatts at each relay station.

From the equipment, rigid waveguide transmission line extends upward to the four metal lens antenna horns mounted on what might be considered to be the equivalent of the fourth story. Special radio towers are not employed. The hilltop location itself furnishes the horizon while the rooftop is sufficiently elevated to clear trees and other local obstructions. Flexible waveguide connects from the vertical rigid waveguide to the horn antennas. The front of each horn is covered with fiberglass to prevent entry of moisture, insects, or superfluous material. Two of the horns face towards New York (one for transmission and one for reception operating 40 megacycles apart) while the other two face in the Boston direction adjacent relay station.

The possibility of any relay station responding to signals coming from more than the adjacent station alone is minimized by three provisions, namely:

1. The relay path is not a straight line from New York to Boston. It is deliberately run with some change in direction at each station as is evident from a study of Fig. 3.

2. The use of highly directive antennas having a beam width of only $1\frac{1}{2}$ degrees. These provide both energy concentration and reduction in interference from undesired points.

3. Change in frequency at each repeater station either by alternating a pair of frequencies or by the use of additional frequencies as are available or required.



Fig. 4. Gasoline generator used to energize microwave field testing equipment in connection with preliminary work on the \$500,000 microwave relay from Chicago to Milwaukee.

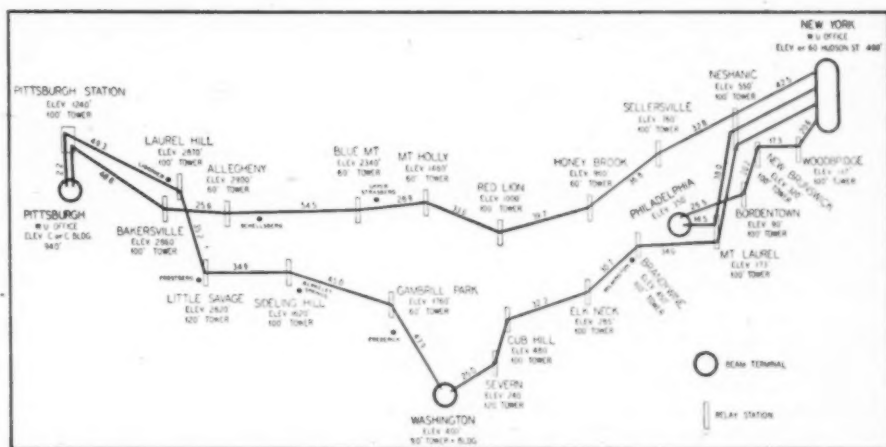


Fig. 5. Locations and tower elevations on the New York-Washington-Pittsburgh triangle.

Each relay station provides a new horizon of range as well as restoring the attenuated incoming signal to full power before being retransmitted. The

Fig. 6. Experimental microwave TV transmitter and antenna system at Hollywood for relaying signals to Mt. Wilson station.

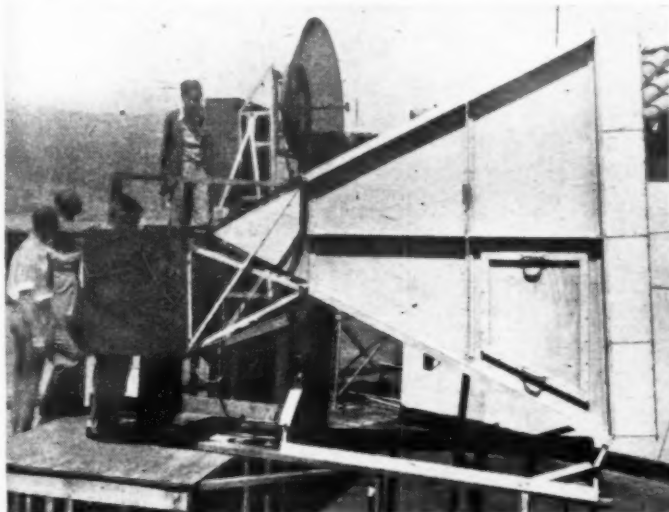
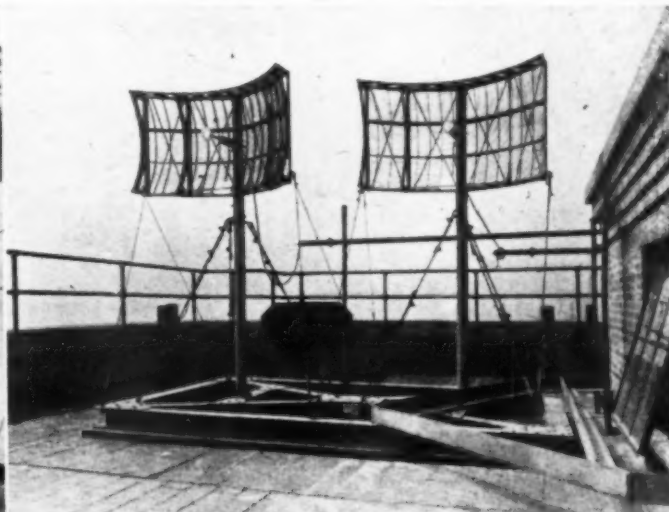


Fig. 7. Raytheon's experimental transmitting and receiving antennas and associated reflector systems at New York terminus.



power of each relay station is identical to the power of the originating point.

In order to permit unattended operation, other than routine weekly maintenance visits, a wire line runs to the Maintenance Test Center at Southfield, N.Y., 12 miles away in the case of Jackie Jones Mountain location. A step-by-step selector can transmit a large number of indications or warnings from the relay station to the maintenance center. These include:

Functions 1 to 4 to indicate that power is low on one of the corresponding channels or equipment bays.

Function 5 might indicate that the door to the building has been opened.

Functions 6 and 7 might mean that temperature is too high on the first or the second floors respectively.

Functions 8 and 9 might mean that the temperature is too low on the first or the second floors respectively.

Function 10 may indicate that the outside power has failed.

Function 11 might indicate that emergency power from the storage batteries is operating the equipment.

Function 12 might indicate that the main emergency generator has started up.

Additional functions are provided, as required, for a particular station.

An example for a particular station might be that a loss of 31 db. takes place in the transmission from or to an adjacent station. The signal may be received on 3930 megacycles, restored in signal strength and retransmitted on 3970 megacycles.

At the transmitting terminus, the sequence of events is as follows:

1. Video from a television studio is received by coaxial cable. In other systems this could alternately be by microwaves or by direct reception on a television receiver. The coaxial cable may be one $\frac{3}{8}$ " cable of several in the over-all cable. It is intended to pass 2.7 megacycles, in the case of the Bell System.

2. It undergoes amplification at the video frequency.

3. The signal then encounters a reactive network so that variations in amplitude give variations in reactance of an oscillator having a mean frequency of 65 megacycles which phase modulates the transmitter at that frequency.

4. This is fed to a balanced crystal modulator. An FM signal from the microwave oscillator is also injected so as to step the 65 megacycles up to the microwave frequency.

5. The signal then leaves the balanced modulator, then passes through four r.f. amplifier stages to the antenna.

At the receiving terminus or at a repeater-booster point, the sequence of events is as follows:

1. The signal picked up by the antenna system is fed through filters to the balanced crystal converter.

2. A local oscillator results in an i.f. frequency of 65 megacycles.

3. It then undergoes a 20 db. gain in a preamplifier and a 50 db. gain in the main amplifier at the i.f. frequency.

4. It then feeds through FM receiver limiter and discriminator network.

5. The output goes through a video

amplifier and feeds into the local video cables or other provision.

The microwave tubes employed are the Type 2K56 reflex oscillators and four stages of Type 402A amplifiers staggered to give about a half-watt output. If any unit fails in a relay station, it is sent back to the maintenance center at Hartford, Connecticut even if it involves no more than the changing of a tube. This permits proper equipment adjustment on the basis of the replaced tube.

The frequency tolerance authorized by the FCC for this particular type and frequency is .05%. Some modification in antenna horn placement was necessary at the first repeater station because the building was inadvertently spotted on the basis of magnetic rather than true geographical bearings. As a result, a discrepancy of about 15 degrees took place. This is a danger which relay station planners should guard against in spotting a structure and the directive antennas which it must support.

The microwave radio system used by the National Broadcasting Company between New York City (Radio City control point for reception and Empire State building for transmission) and Washington, D.C. also serves intermediate cities such as Philadelphia and Baltimore. The system is partly owned by Philco, as far as Philadelphia, while RCA/NBC own it the rest of the way. The Philco portion operates on nominal frequencies of 1370 and 1410 megacycles. The remainder operates on frequencies between 6900

(Continued on page 150)

Fig. 8. Cut-away view of a typical radio relay station on the Bell System radio relay route between New York and Boston, showing arrangement of equipment in the building. Emergency power equipment and storage batteries are on the first floor, radio equipment on the second floor, and special microwave antennas for receiving and beaming are located on the roof.

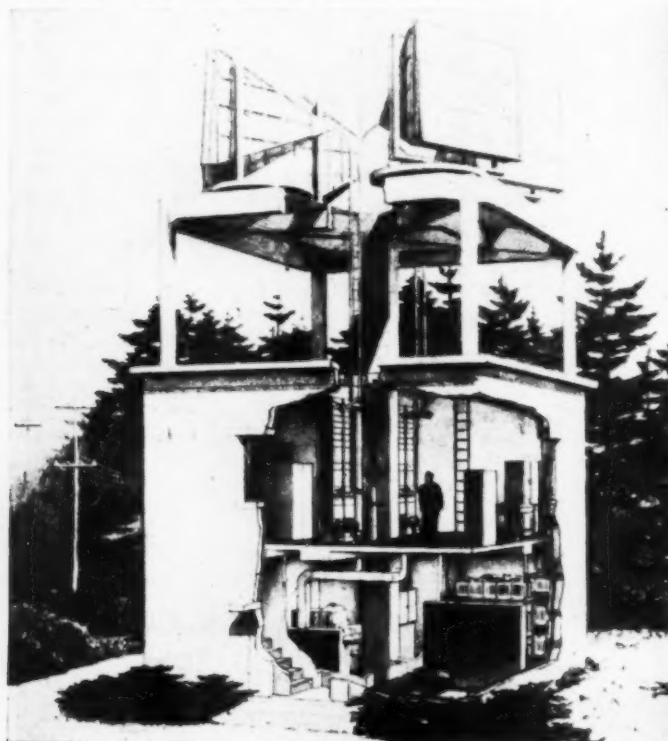
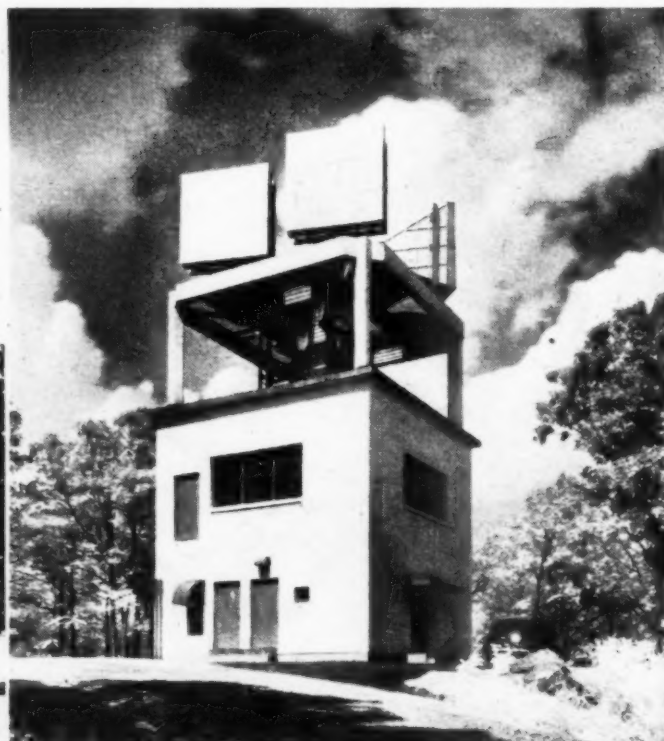


Fig. 9. One of the seven intermediate hilltop stations along route of the Bell System's new radio relay system between New York and Boston. Electro-magnetic lenses in the four horns atop the buildings receive and transmit long distance communications between the two stations. This is the station which is located on Jackie Jones Mountain near Haverstraw, New York.



Adapting Webster Record Changers for Microgroove Recordings

By
ROBERT W. TIMMERMAN, WBYIF

OWNERS of Webster-Chicago record changers Models 50, 56, and 70 will be pleased to learn that these machines can be readily adapted to handle the new Long-Playing (LP) Microgroove records. The modification in no way hinders the playing of older type records, and a switch from one type to the other can be accomplished in about half a minute.

Two major changes in recording characteristics make possible the long-playing feature of the new records; the rotation speed has been reduced from 78 to $33\frac{1}{3}$ r.p.m., and the grooves which have been made much narrower and closer together. Associated changes must be made in the playing equipment. The speed of the Webster turntable is altered by a simple change in the diameter of the drive motor pulley, and the addition of a pickup of the lightweight, Microgroove type mounted on the baseplate. The existing pickup and changing mechanism are not disturbed. Of course, the automatic changing feature cannot be employed when playing microgroove records, but these pressings are such that it is usually necessary to turn a record over for proper playing sequence, which the changer cannot do in any case.

The following discussion is a detailed description of the modification procedure. Turntables of all the Webster machines are driven by friction pulleys. The motor drives a rubber idler wheel, which, in turn, drives the inside of the table rim. The motor is of the shaded pole induction type, the speed of which cannot be satisfactorily changed. The change is accomplished by altering the drive ratio from motor to turntable. The motor speed is approximately 1650 r.p.m. with a step-down of about 21 times to 78 r.p.m. For a turntable speed of $33\frac{1}{3}$ r.p.m. the ratio must be increased to 50. To do this, the diameter of the motor pulley must be reduced from 0.456 inch (in the 60-cycle model) to about 0.195 inch. The diameter of the motor shaft is $\frac{1}{4}$ inch. The problem is, therefore, to reduce the diameter to the required dimension. If a lathe is available, the shaft may be turned down in the conventional manner, however the necessary work can be



Fig. 1. The Webster Model 56 record changer as modified for playing Microgroove records.

Reproduction of Columbia's new Microgroove records requires a new pickup and a $33\frac{1}{3}$ r.p.m. turntable.

done satisfactorily with a small, flat file as the only tool.

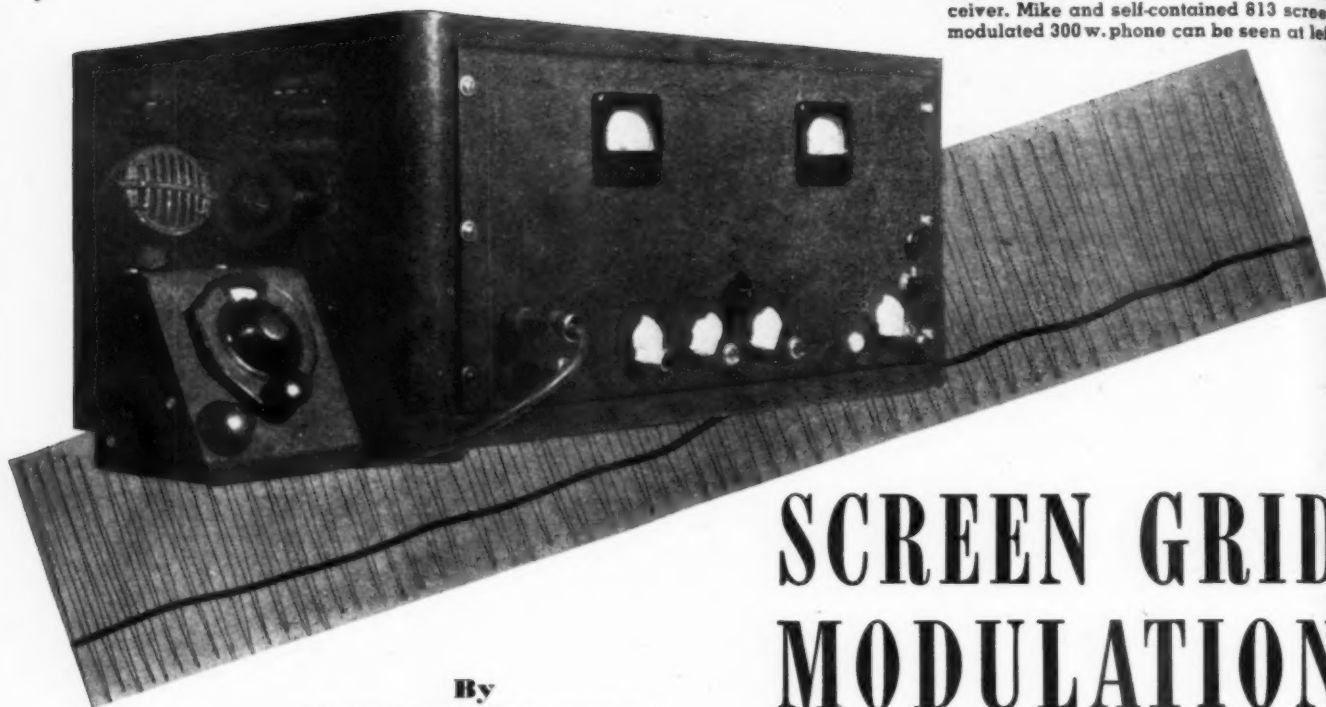
Remove the motor from the underside of the baseplate, leaving the electric connections intact. Remove the brass pulley from the shaft, rest the motor on its side on a firm support, and start it running. By gentle application of the file, gradually reduce the shaft diameter for a length of about $\frac{1}{8}$ inch. Most of the cutting is done under the influence of the shaft rotation. Care should be taken to keep the cut flat and parallel to the shaft axis. A micrometer is helpful at this stage, but an acceptable job can be done by eye. When the diameter has reached about 0.2 (13/64) inch, proceed cautiously to avoid making the shaft too small. Final cutting should be done only after a test run.

Before the motor is remounted, a minor operation must be performed on the main baseplate. The idler wheel is held in contact with the motor pulley and turntable rim by a spring and universal pivot assembly. In the original condition, the idler wheel will not move a sufficient distance to make contact with the re-

duced-size motor pulley. To correct this, remove the idler from its shaft, which will expose the hole in the baseplate that acts as a stop for a lug on the idler assembly. With a small file enlarge the hole in the baseplate so that the stop lug will travel about $\frac{1}{4}$ inch farther than it would normally. Fig. 2 is a closeup view of the drive mechanism showing the essential parts at this stage. The spring which holds the idler wheel against the turntable and motor shaft has been temporarily disconnected. Replace the parts and then check the turntable rotation rate by counting revolutions, or with the aid of one of the cardboard stroboscope discs obtainable from radio supply stores. The rate probably will be a little faster than $33\frac{1}{3}$ r.p.m. Demount the motor, remove a small amount of metal from the shaft, and then recheck the speed. From the difference in speed of the two checks, it should be possible to come very close to the required speed on the third try. Finally, polish the shaft with fine emery paper or cloth. At this point remove the top bearing

(Continued on page 112)

Complete station with 10 meter converter, output of which is fed into home b.c. receiver. Mike and self-contained 813 screen modulated 300 w. phone can be seen at left.



SCREEN GRID MODULATION

By
ALVA WILSON, W5DAD

A simple method for adding modulation to many c.w. rigs thus providing high power phone at low cost.

HERE is a type of high level modulation that compares favorably with plate modulation, without any of the expensive audio equipment required for the latter. A single 6V6 will fully modulate a 250-watt carrier; a pair will modulate a 500 watt carrier, or a pair of 6L6's will fully modulate a kilowatt.

The author does not know why this has not been put to practical use long ago since he first used it on phonograph oscillators for wireless record players as far back as 1929. At this time the screen of a 24 type tube was modulated by a phonograph pick-up, the 24 tube being used as an oscillator, and the output of this high impedance pickup being coupled directly to the screen grid of the 24 tube. Later a type 27 tube was added so a tone filter circuit could be incorporated in the output of the phonograph pickup without sacrificing the audio gain necessary to modulate the 24 tube screen. An old "plate to magnetic speaker" transformer was used to match the 27 tube to the screen of the 24 tube.

Later we tried screen modulating a pair of 46's and also 59's with fair results. These were the most powerful pentodes available to amateurs for several years. For the time being screen modulation was discarded, since we had to turn to triodes in order to increase our power, and after trying both grid and cathode modulation, and finding their efficiency low and the former very critical to operate as well, we had to turn to plate modulation.

To those who may think that cathode modulation is fairly new, we wish to state that in 1928 we built several record players of the wireless variety and modulated a type 27 tube oscillator by inserting the phono pickup leads directly between the cathode and ground, bypassing the cathode only for radio frequencies.

The recent war has brought out several new type pentodes and tetrodes, many of which have been placed upon the surplus market at ridiculously low prices.

Having several 807's and 813's lying around the shack with some other accumulated junk, we pondered the idea of screen modulation. Finally, unable to stand the suspense any longer, we drew up a rough diagram, gathered up an assortment of junked parts, including an 813 tube, a 1250 volt power supply, formerly used on a diathermy machine which had been discarded, a 250 volt receiver transformer for the modulation and r.f. driver section, a discarded chassis base 10"x16"x3" and the necessary resistors, condensers, sockets, etc. and started in on the old discarded idea with surprising results. By careful placement of parts we were able to place all components on the one chassis base, including the final power supply, forming a complete 250 watt, 100 per-cent modulated rig that could be slipped into an empty SX-25 receiver cabinet.

We have made many contacts on 10 and 11 meters and all quality reports were excellent. Ninety per-cent of the

hams worked wanted to know the particulars of the circuit, indicating popular interest in the low construction cost and quality obtained using this means of modulation.

The first attempt was doubling in the 813 and the speech quality was poor. It was thought that we had the answer as to why screen modulation was not used, but after having put in several hours constructing the rig, we were loath to give up the idea without experimenting with it a little further. Recalling past experiences, we remembered a mobile 807 rig we had tried to modulate. It had used a single r.f. tube ahead of the 807 and the frequency tripled in the 807. Not nearly 100 per-cent modulation could be reached and the edges were very rough. We tried doubling with better results, and finally obtained excellent quality by running the 10 meter frequency straight through the 807 stage. However, this necessitated a lot of shielding etc. to get rid of self oscillation.

Following up this lead, we tried driving the 813 straight through on 10 meters with much improvement in quality. However, the sidebands were still rough when a high percentage of modulation was used, giving a result similar to one obtained when a plate modulated triode final was not properly neutralized.

This 813 amplifier would not "take off" by itself, but after giving it a bit of thought and after re-reading an article in February "QST" by Richard

M. Smith, entitled "A Stabilized 813 Amplifier," we decided to neutralize the 813 and see what happened—and presto—the quality was excellent.

Modulation matching between the audio power and screen seems to be no more critical than plate modulation, and the same type modulation transformers may be used for either system. In other words, if you are now modulating a low power rig using plate modulation you can add a pentode or tetrode final and modulate it with your present modulation equipment, without buying a lot of expensive modulation equipment, simply by removing the secondary of your modulation transformer from the present plate circuit, and inserting it into the screen circuit of your new final amplifier. To get the best results, simply load up the tube as you would for plate modulation.

The grid excitation, similar to plate modulation, must be adequate, and there is no backing off of excitation to reduce plate output as is common to grid or suppressor modulation; rather, the near maximum grid drive required for maximum plate output is to be desired for best quality of speech. Therefore, for proper operating conditions for any type tube, merely look up the tube characteristics for the particular tube you wish to use, for class C, plate modulated service, and apply them to your screen modulated amplifier.

A word about how this amplitude modulation works will not be amiss here. Upon analyzing plate modulation, we find we actually get an increase in r.f. output on our antenna when a signal is fed into the speech amplifier. This is caused by the added voltage supplied from the audio amplifier, added to the standing plate voltage on the final amplifier. Since we do not have sufficient audio voltage available for plate modulation, we must approach it from another angle—put a milliammeter in the plate circuit of a screen grid tube, and set the screen and plate at their rated voltage. Then increase the screen voltage slightly—watch the reading of the milliammeter show an increase in the plate current, then decrease the screen voltage, and watch the plate current decrease. In other words, we now have a perfect means of controlling the plate output of the tube. It is only necessary to vary this screen voltage at audio frequencies in order to produce amplitude modulation.

Since we are increasing the screen voltage on one-half of the audio cycle, it would seem that the rating of the tube would be exceeded, but such is not the case, since one-half of the cycle increases the screen voltage peak, while the other half of the cycle decreases the screen voltage peak by the same amount. This change in screen voltage is followed perfectly by the plate and 100 per-cent modulation can readily be realized. The usual increase on the antenna current meter can be observed, as well as an increase in the

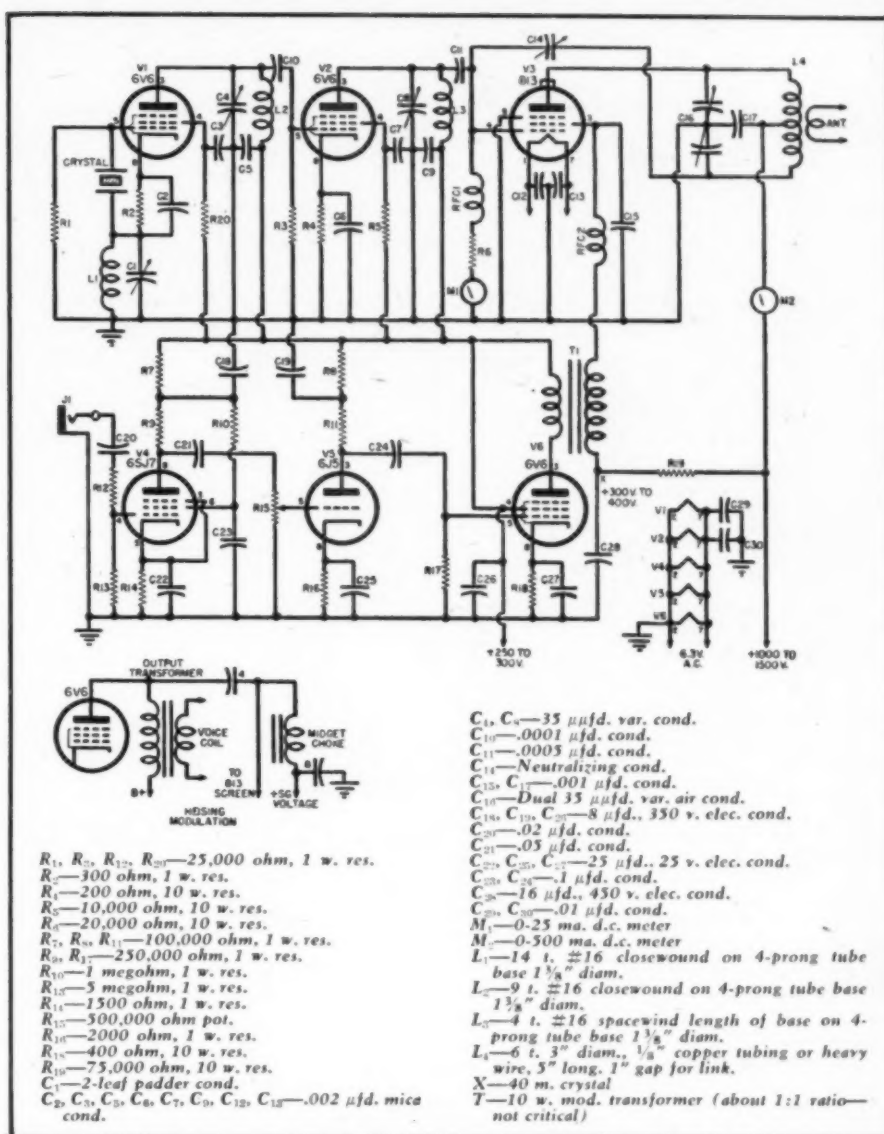


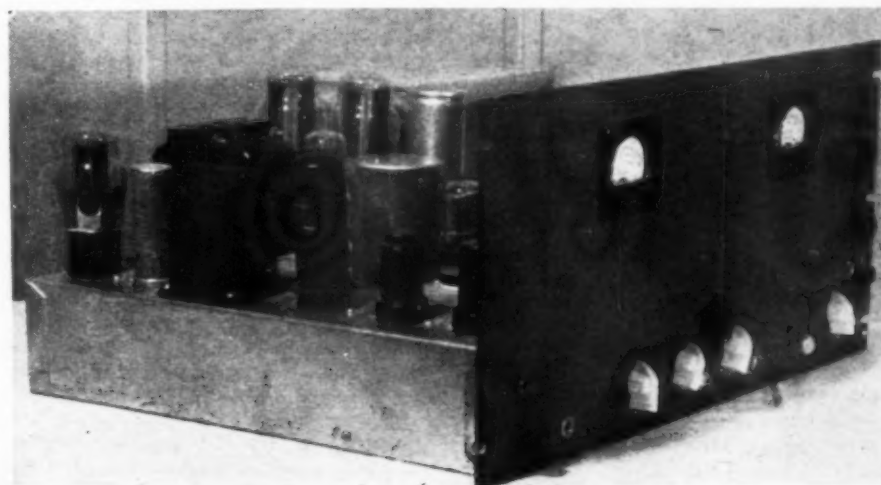
Fig. 1. Method for applying screen grid modulation to conventional c.w. rig.

plate current milliammeter reading.

For those who wish to experiment further with this idea, the experimen-

tal diagram of the completed 813 transmitter as used by W5DAD in (Continued on page 86)

Front view of 813-screen grid modulator. The two meters are the 0.25 ma. 813 grid meter and the 0.500 ma. 813 plate meter. Miniature neon bulbs which fit the 6-volt pilot light jewel assembly are used as resonance indicators on other stages. Unmounted types are used and leads are soldered to hot side of condenser or tube plate lead. These should be mounted close with short leads.



A low-cost MOBILE STATION

By
ROBERT LEWIS
W8MQU



Front panel view of home-built converter unit. Main tuning control, C, C., is shown in center of panel.

Part 1. The converter—an easily built unit that covers both 10 and 11 meter bands. Its output connects directly to any conventional broadcast-type auto receiver. A companion transmitter unit will be covered next month.

PROBABLY nine out of ten hams have to budget their pennies in these days of high living costs, so when they come to the envelope marked "Radio Parts" they are likely to be scraping the bottom of the barrel.

This writer, after being confined to a closed room with some of his fellow hobbyists, contracted a bad case of "mobilitis." The biggest problem to be solved was how to acquire a mobile rig and have beans on the table at the same time. After digging out the slide rule and some radio catalogues, the writer calculated that the cost of manufactured equipment would make a dent in \$150 that would leave just about enough to get a battery charge. Hence the decision to construct the station at home. Anyway it's more fun to build your own gear.

Naturally you can't work anyone unless you can hear him, so the first project was to build a converter to work into the car radio. It is assumed that most hams who own cars have standard broadcast radios therein. A number of circuits were considered, along with the available space in the

car, and other factors. The one-tube converter circuit of Fig. 1 got the nod. The circuit was developed around a 6BE6 miniature pentagrid converter tube, which has characteristics similar to those of the 6SA7. Of course the small size of the tube was the determining factor in using the 6BE6. A look at the circuit will show that it is straightforward in design. The converter tunes from the low end of the 11 meter band to the high end of 10, or about 27 to 30 mc. In this particular instance the oscillator was set to tune on the low frequency side of the mixer. The output frequency was fixed at 1600 kc. so that it might be fed into a standard broadcast receiver. Plate and filament voltages are supplied by the car radio. It was deemed advisable to use a voltage regulator to stabilize the screen voltage. For this job the miniature OB2 was chosen. The 6-volt supply in an automobile varies somewhat, depending on the output of the generator. Therefore the voltage regulator was incorporated to minimize resultant plate voltage changes. Total plate current drain in the converter, including OB2

current, is about 17 ma. The filament operates at 0.3 amp. It will be noted that transmitter controls are also incorporated into the receiver, which is built into a standard 4 x 5 x 6-inch utility box. The jack at the left is a standard PL68 jack into which is plugged a T17B carbon microphone or any other carbon mike having a built-in push-to-talk switch. The pilot light at the center of the receiver cabinet indicates when 6 volts is applied to the transmitter dynamotor. The rotary switch at the right performs two functions. When thrown to the right, 6 volts for converter and transmitter filaments and relay coil are applied; at the same time the antenna is connected to the converter input circuit, and the lead to the broadcast antenna is switched to the converter output transformer. Throwing the switch to the left removes all filament and relay voltages and bypasses the antenna directly to the broadcast receiver for standard broadcast reception. Of course the push-to-talk switch on the microphone must be depressed in order to actuate the transmitter relay. All connections from the receiver to the transmitter are made to a terminal strip on the rear of the converter cabinet, while filament and plate voltage leads and antenna leads to the broadcast receiver are of single-conductor shielded wire.

It will be noted that the converter mixer and oscillator coils are wound

RADIO & TELEVISION NEWS

on slug-tuned forms. This feature makes it a simple process to adjust the coils to their proper inductance. Tuned circuits are wired with 16-gauge solid wire, which gives better oscillator stability against mechanical vibration than stranded wire. The balance of the wiring incorporates stranded wire. Due to the vibration to which the equipment will be subjected, all parts are mounted rigidly. Low impedance antenna leads are shielded, as are all leads entering the cabinet, the latter precaution being taken to prevent noise pickup. In calculating the value of the screen resistor, R_s , the plate supply voltage from the broadcast set must be known. For example let us consider the case in question. The supply voltage was measured at about 178 volts with the car running and the generator supplying about 20 amperes. The voltage drop within the OB2 over a wide current range is 108 volts. Thus a drop of 70 volts was required across R_s , with normal 6BE6 screen current of 7 ma., and OB2 current set at 10 ma. for stable operation. Applying Ohm's law results in a resistance value of about 4000 ohms. If the supply voltage should be higher than this, then a higher value of screen resistor should be used. Although the OB2 will handle 30 ma., an operating current of about 10 ma. is sufficient for stable operation, and, of course places less drain on the broadcast receiver power supply.

The most critical adjustments necessary are the settings of the slugs in the r.f. and oscillator coils and also the padding condensers, C_2 and C_3 . The coils should be wound exactly as specified in the parts list for best performance, as considerable time was spent on the original unit adjusting the coils for optimum antenna coupling and oscillator feedback. Prior to construction, calculations were made to deter-

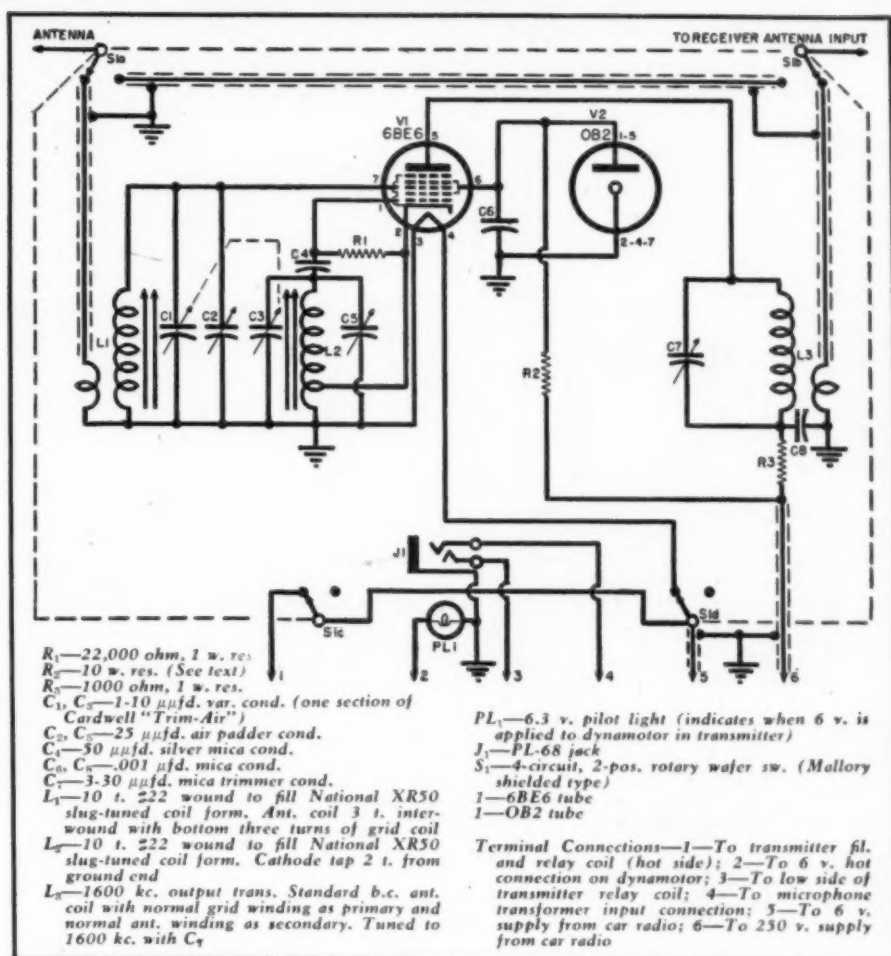


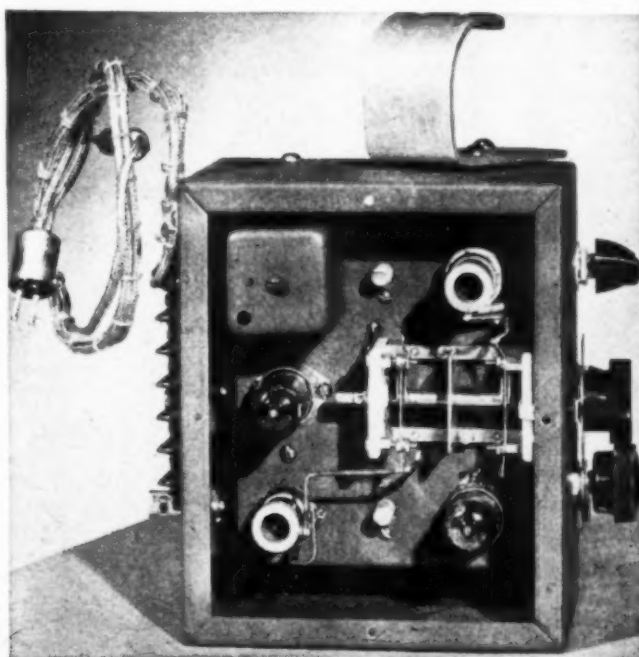
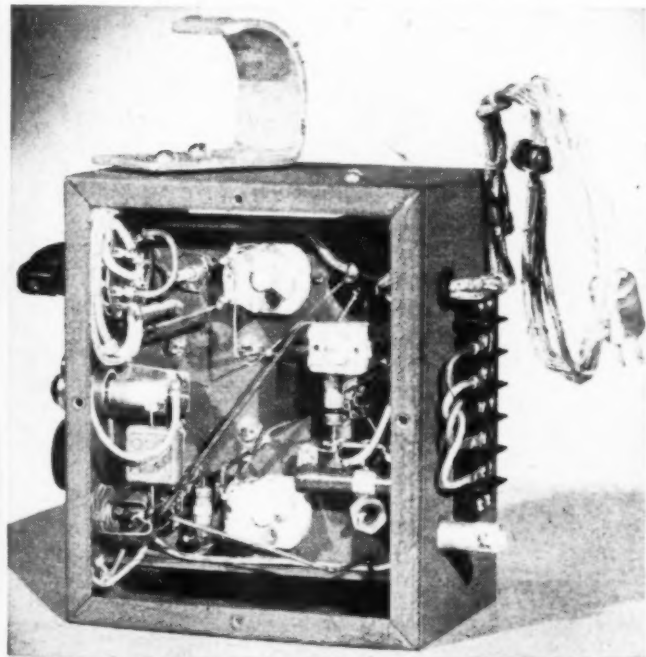
Fig. 1. Complete schematic diagram of converter unit. The switching arrangement shown is based upon its use with the companion transmitter covered next month.

mine relative values of L and C required to insure tracking of the two tuned circuits. Figures indicated the oscillator padder should be set at 12 μ fd., or about $\frac{1}{2}$ total capacity (if a

25 μ fd. padder is used, as indicated), while mixer padder C_2 should be set at about 10 μ fd. After setting the padders as close as possible to these
 (Continued on page 148)

Under chassis view of the converter unit used with auto radio.

Top chassis view of the same unit with protective cover removed.



Novel Controlled RECTIFIER

By
S. S. PESCHEL



Over-all view shows construction details of home-built rectifier unit.

Experimenters, servicemen, and hams can build this simple unit from available junk box parts.

MANY attempts have been made to obtain a variable output from a simple rectifier power supply. Old timers will recall the "B" eliminator which featured one or two variable output potentiometers.

Another old stunt¹ used a rheostat in series with the input condenser of a filter in order to obtain a variation in output voltage between the extremes of the voltages obtained with condenser input as a maximum and with choke input as a minimum.

Other methods for obtaining this variable output were described in the author's article "Power Supply Output Voltage Control" (RADIO & TELEVISION NEWS, October, 1948). Complex and expensive power supplies with variable output are available but lack the desired simplicity of construction.

The previous control unit² functioned as an electronic rheostat which could be added to any standard power supply. It involved the use of a control tube plus a rectifier tube, within

the standard power supply. The controlled rectifier to be described in this article contains only one tube, and, as the name implies, is both a rectifier and a control tube. See Fig. 1A.

The new circuit will be recognized as the control tube previously described except that it is now supplied with a.c. instead of d.c. The principle of operation has already been covered.² An inspection of the basic circuit will suggest an obvious improvement, namely, the use of a full-wave rectifier. See Fig. 1B.

The requirements of this circuit call for the use of a heavy twin-triode or the use of two tubes in a full-wave arrangement. Based on previous experience, the following tubes were tried; a 6AS7G, an 829, a pair of 1625's (12 volt 807's), and a pair of 6L6's.

The 6AS7G with its low plate resistance of 280 ohms at 125 ma. plate current per triode section, introduces a tube drop of approximately 35 volts at zero bias. Standard rectifier tubes

such as the 5U4G, 5Z3, 5Y3, etc. run approximately 58 to 60 volts tube drop per section at the rated current per plate.

The different tube types were tested in a conventional rectifier/filter circuit which employed a standard radio-type power transformer. The tabulation of Fig. 2 shows the results obtained using the 6AS7G, a pair of 1625's, and a pair of 6L6's.

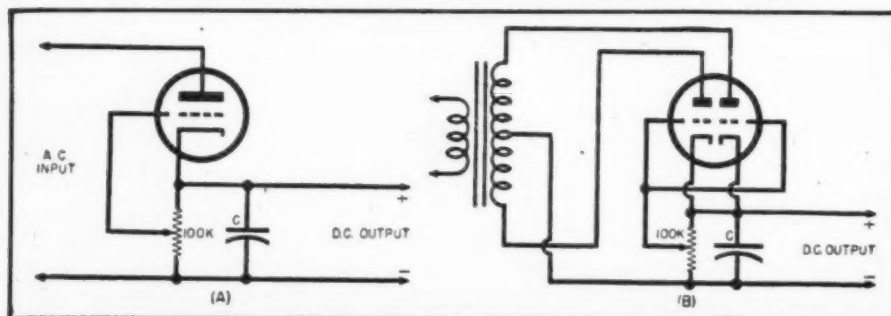
From the tabulated data of Fig. 2, it can be seen that the 6AS7G is advantageous in applications where low tube drop is important and where control range is a secondary consideration. Other tubes, the 829, 807, 1625, 6L6, etc., are better from the standpoint of greater control range but they have a higher internal resistance. At medium load currents, at 100 ma. or so, they are quite satisfactory. At higher currents the 1625's appear to have lower tube drop than 6L6's. The 829, not shown in the tabulation, generally runs quite a bit better than the 1625's.

Several power supplies using the various tube types have been constructed and placed in operation. One of the units, shown in the photograph and diagrammed in Fig. 3, uses the 6AS7G as the controlled rectifier. A standard radio-type power transformer and filter circuit is used. The simple grid control is the output potentiometer scheme described previously.³

The parts list of Fig. 3 includes the components used to construct the unit shown in the photograph. The individual constructor may have on hand power supply components which differ

(Continued on page 106)

Fig. 1. (A) Basic controlled rectifier. (B) Basic full-wave controlled rectifier.



¹ "Hints and Kinks," QST, June, 1939, page 51.
² Peschel, S.S.: "Power Supply Output Voltage Control," RADIO & TELEVISION NEWS, October, 1948.

CUSTOM-BUILT TELESETS Provide New Video Market

By AUSTIN C. LESCARBOURA



One type of custom-built installation which has found wide acceptance with televiewers.

Built-in television receivers provide business executives with up-to-date news coverage and radio servicemen with a new source of income.

A NEW and virtually untapped market for television receivers is awaiting the alert merchandiser. What tavern television did for the then-infant video industry, the custom-built office installation may repeat in the form of increased sales.

Office television offers almost infinite possibilities. The busy executive can "telelook" or take a peek at the world without leaving his desk or comfortable swivel chair. He can open his drawer, flip a switch, turn a knob, and he has the baseball game, news events, the political campaign—all within the confines of his office.

One such installation, in the office of Dr. Allen B. DuMont, pioneer television worker and manufacturer, is shown on this month's cover.

There is nothing particularly unusual about office television except that most executives haven't begun to think of television in terms of the business office. Years ago they would send the office boy out to buy the afternoon newspapers in order to get the latest news, stock reports, business information—and perhaps a sneak look at the sports pages. Later the office radio set came into use, providing cover-

age of news events and important happenings.

Now, late in 1948, the executive can have the world at his doorstep with a television receiver in his office. It can be a standard table model video set or a console receiver but of course the refinement is the standard custom model which mounts in the office wall and out of the way.

The DuMont standard custom tele-set comprises a large angle-iron framework supporting the various chassis and loudspeaker which is placed behind the office wall. The 20 inch picture tube is framed on the wall. The tuner and controls, however, are located remote from the receiver but at the fingertips of the operator for maximum convenience and comfort. In Dr. DuMont's office installation, the compact control unit is placed in a desk drawer.

The Inputuner, standard in all DuMont telesets, provides for continuous tuning throughout the entire TV and FM bands, or from 44 to 216 mc. in one continuous rotation of a single knob with illuminated dial. The compact control unit also includes a tuning meter for accurately tuning in the

chosen channel. Volume and video contrast controls, the "on-off" switch, and a switch for cutting in the control either at the remote control unit or at the receiver proper are included.

In order to obtain an intense image that can be readily viewed in the sunlit office, the usual cathode-ray tube potential of 15,000 volts has been stepped up to 23,000 volts. The control unit transmits the composite video-audio signal to the receiver proper, via a suitable cable, along with the essential control functions. Other controls are at the receiver proper. Since the control functions are handled at the viewing distance from the television screen, quicker and better adjustments are possible with this remote type of operation.

Custom installation work is not too complex as such units are shipped from the factory ready to install, with all chassis, controls, and screens ready to be built into the wall, furniture, or other cabinet.

Servicemen and dealers might investigate the possibility of increasing their incomes by offering such custom service to their clientele. This type of service can prove to be both pleasant and profitable, and an enthusiastic customer for office television can become a real asset to you in the form of increased business. An executive office "showroom" for your work can result in a nice boost in your income.

-30-



Fig. 1. United States Television's sweep generator.

How to Use SWEEP GENERATORS With TV RECEIVERS

A discussion of the techniques to be employed in using sweep generators in the servicing of video receivers. Analysis of results is also discussed.

ONE of the most important aspects of television service work is the visual alignment of the i.f. and r.f. circuits in television receivers. The equipment required for this job consists of a sweep signal generator to produce the signal and an oscilloscope to indicate visually the response pattern of the circuit through which the signal has just passed. By studying the shape of this final curve we can determine whether the circuit under test is properly aligned.

To use both instruments to their fullest extent, the serviceman must be able to properly attach the signal generator to the receiver under test and he must be able to interpret the patterns that appear on the scope screen. The patterns, in turn, will depend upon the circuit under test and the type of signal generated in the sweep oscillator. The latter half of the preceding statement is most important and yet it is not adequately understood by many servicemen. It is common belief among many servicemen that the response curve for any one particular circuit—as viewed on a scope screen—will be always the same no matter what type of sweep generator provides the signal input. *This need not be true unless the sweep generator and the indicating oscilloscope are*

properly used. Various sweep generators can produce different patterns on the screen even though applied to the same network. However, if correctly employed, each type of sweep generator output will produce the same response pattern when applied to the same circuit. The problem, then, is to understand how the frequency output of each type of sweep generator varies, what effect this has on the circuit under test, and what must be done to obtain the correct response pattern on the screen.

The number of commercial sweep signal generators designed specifically for television use is limited. Those that are available employ either a sinusoidal frequency variation or a saw-tooth frequency variation.

Sinusoidal Frequency Variation

A signal generator in which the output frequency varies in a sinusoidal manner is the U.S.T. unit shown in Fig. 1. To understand this frequency variation, consider the sine wave shown in Fig. 2. At the start of the sine wave, point A, the oscillator stage in the sweep generator unit is producing a certain frequency signal. Let us say this is 23 mc. Then, at time A, the signal frequency output of the generator is 23 mc. However, this is

true only momentarily. At the next instant, the modulating or driving voltage within the sweep generator is swinging the frequency of the generator toward 25 mc. and, at time B, the generator output has reached 25 mc. During the next interval of time, the internal driving voltage within the generator causes the output frequency to drop down to 23 mc. This is the output frequency at time C.

Following the path of the sine curve of Fig. 2, the generator output frequency continues to decrease to 21 mc., stopping here and gradually returning to 23 mc. One complete cycle has now been completed and similar frequency variations will be repeated for as long as the equipment is in use. The front dial of the instrument would be set to a frequency of 23 mc. (the mean frequency) and the "frequency sweep" dial would indicate 4 mc. Thus, the over-all sweep would be (23 mc.-2 mc.) or 21 mc. to (23 mc.+2 mc.) or 25 mc. The difference between the highest and lowest frequencies of the sweep is 4 mc.

Now, let us apply this frequency-modulated signal (for that is what it is) to the tuned circuit shown in Fig. 3A. An oscilloscope will receive the output voltage appearing across this circuit and, if properly connected, should produce on its screen the pattern shown in Fig. 3B.

The internal deflection voltage of the scope is a saw-tooth voltage, as shown in Fig. 4. This is the voltage which is ordinarily used to swing the beam across the screen. The beam, under the influence of this saw-tooth voltage, starts at the left-hand side of

the screen and progresses at an even, steady rate toward the right. This corresponds to the rise in deflection voltage from A to B. When the deflection voltage attains the voltage value of point B, the beam will be at the far right-hand side of the screen. From B to C the voltage drops sharply and the electron beam swings back rapidly to the left-hand side of the screen. Each saw-tooth cycle is repeated in like manner.

Now, it is possible to connect a sweep generator, whose output frequency varies sinusoidally, to a circuit and to observe the response of this circuit on a scope screen where the beam is deflected by a saw-tooth voltage. However, this results in a distorted pattern (as we shall see later) and it is best to use a sine wave deflection voltage for the electron beam. Therefore, turn off the horizontal sweep deflection voltage developed in the oscilloscope (by turning the frequency knob to the "off" position) and substitute a sine wave voltage obtained from the front panel of the sweep signal generator. Outlet terminals, provided on the front panel of the sweep generator, make available a portion of the same 60 cycle voltage driving the generator. This voltage is applied—through a coaxial cable or a pair of twisted leads—to the horizontal input terminals of the oscilloscope. The deflection of the electron beam will now follow a sinusoidal motion, which differs markedly from its motion under the influence of a saw-tooth wave. Its action is as follows. (Assume the sine wave voltage of Fig. 5 is applied to the horizontal deflection plates of the scope cathode-ray tube.)

At time A, the deflection voltage is zero and the electron beam passes unmolested through the deflection plates and strikes the center of the scope screen. From A to B, the sine wave voltage is increasing, forcing the beam to move to the right side of the screen. At time B, the beam is as far to the right as it will travel and stops momentarily. As the voltage decreases from B to C, the beam starts moving back toward the center of the screen, at first slowly and then picking up speed until, by the time the deflection voltage has reached point C, the beam is at the center of the screen and moving quite rapidly to the left.

From C to D, the leftward travel continues although the beam slows down as the far left-hand side of the screen is approached. When the deflection voltage reaches the value of point D, the beam is as far to the left as it will go and it stops momentarily. Then under the pressure of an increasingly positive voltage (from time D to E), the beam begins to travel toward the center, picking up speed until, at the center, it is traveling at its maximum rate of speed toward the right. This completes one cycle; successive cycles will produce identical motion.

Note carefully the difference in beam motion when the deflection volt-

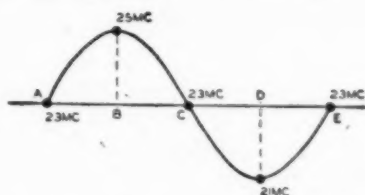
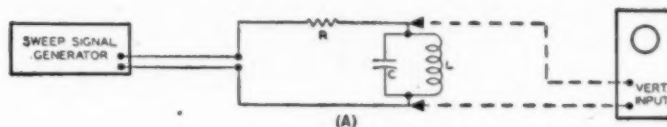


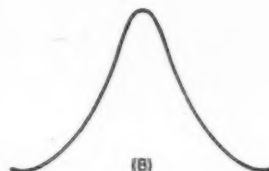
Fig. 2. The manner in which the signal output of U. S. Television's generator (shown in Fig. 1) varies.



Fig. 8. The result of the action described in Fig. 9 as this result appears on the screen of the oscilloscope.



(A)



(B)

Fig. 3. (A) The application of a frequency-modulated signal to a tuned circuit. (B) Response of circuit as it appears on oscilloscope screen.

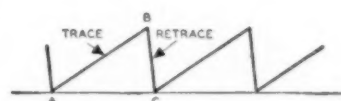


Fig. 4. Saw-tooth deflection voltage generated internally at the scope.

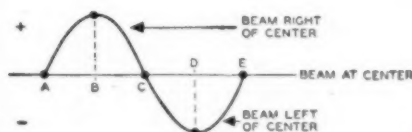


Fig. 5. Motion of electron beam under influence of sinusoidal deflection voltage.

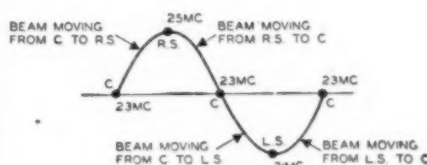


Fig. 6. A composite diagram indicating how the beam and the sweep generator output signal vary in step, sinusoidally.

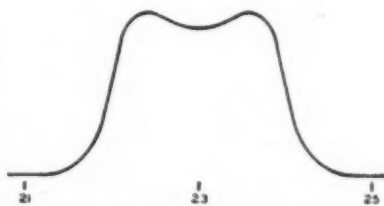


Fig. 7. When the sweep frequency of the generator and the electron beam in the scope both vary in the same manner, the frequency spacing of the response pattern will always be linear, as shown.

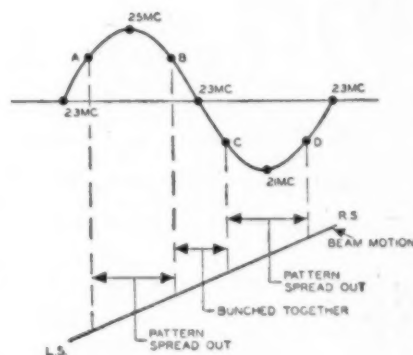


Fig. 9. A sinusoidal frequency variation coupled with a linear saw-tooth beam motion will produce a pattern that is bunched together in the middle region and spread out at both ends.

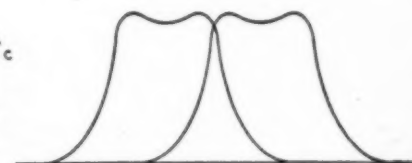


Fig. 10. A double pattern of Fig. 7 due to an improper phase control setting.

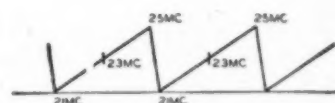


Fig. 11. A linear variation in output frequency from a television sweep generator, i.e., the Kay Electric "Mega-Sweep" shown in Fig. 12.



Fig. 12. A sweep signal generator using a single saw-tooth sweeping voltage. This unit is the Kay Electric Company's "Mega-Sweep."

age is changed from a saw-tooth to a sine wave. With saw-tooth deflection, the electron beam travels from left to right at a steady rate of speed. At the far right-hand side of the screen, the beam retraces rapidly to the left. Generally this motion is so rapid that the retrace line is not visible. With sine-wave deflection, the beam is always visible. There is no rapid retrace such as we find with saw-tooth deflection. The speed of the beam varies from point to point in its path. At the far ends of the path the speed is at its lowest value; at the center of its path the beam travels fastest. The reader will recognize this motion as similar to that of a pendulum swinging back and forth.

It is now possible to combine the motion of the electron beam across the scope screen with the signal frequency variation of the sweep generator. The composite diagram is shown in Fig. 6. The numbers at each point represent the frequency of the signal applied to the circuit under test; the letters indicate the position of the beam on the screen. To save space, the following abbreviations have been used: *C* = center of screen; *R.S.* = right side of screen; *L.S.* = left side of screen.

When the same type of driving voltage is employed in the sweep generator and in the scope, the frequency

spacing of any pattern appearing on the screen will be linear, i.e., spaced at equal intervals. See Fig. 7. (It is understood, of course, that these frequency figures do not actually appear on the scope screen.) The reason these frequencies are all evenly spaced arises from the use of the same driving voltage both in the signal generator and in the cathode-ray oscilloscope. Thus, when the frequency is changing slowly at the signal generator output, the beam is moving slowly across the screen. On the other hand, when the frequency is changing rapidly along the slopes of the sine wave driving voltage, the beam is moving rapidly across the screen. In this manner, a 1 mc. frequency change when the signal is shifting slowly will occupy as much space on the scope screen as a 1 mc. change when the signal frequency is changing rapidly. This will always be true when the beam and the sweep generator are controlled from the same source. *It will not be true if the voltage driving the beam is of one type and the voltage modulating the sweep generator is of another.* Remember this, for it is most important in all servicing and alignment work. A simple illustration will readily demonstrate what would happen to the response curve if the sweep generator has a sinusoidal frequency variation and the oscilloscope employs its

internal saw-tooth deflection voltage. To simplify the discussion, we will assume that one cycle of the 60-cycle voltage occurs in the time of one saw-tooth wave. Consequently, the beam will travel across the screen at a steady pace whereas the frequency output from the generator will sometimes change rapidly and sometimes slowly. Thus, at times we would expect the response curve to be bunched together while at other times it will be spread out. This is revealed graphically in Fig. 9. From point *B* to point *C* of the sine curve there is a faster frequency change than from *A* to *B* or *C* to *D*. Hence, during the period from *B* to *C*, more of the response curve will be traced out because the signal frequency is changing most rapidly. During the intervals, *A* to *B* and *C* to *D*, the frequency is changing slowly and that portion of the response curve that is traced out will be spread out on the screen. Visually we would see the curve shown in Fig. 8.

Nearly all sweep generators that employ a sinusoidal frequency variation contain a control on their front panel marked "Phase Control." The purpose of this control is to permit adjustment of the 60-cycle driving voltage until one pattern appears on the screen. Many times, a double pattern, such as shown in Fig. 10, is obtained; however, by adjusting the "Phase Control," the two curves can be made to blend into one. Double patterns are due to the fact that although the driving voltages for the beam deflection and the sweep generator are taken from the same source, it does not necessarily follow that these voltages are still in phase with each other by the time they actually reach the beam deflection plates in the scope or the modulator tube in the sweep generator. Through the action of the phase control, it is possible to bring these two voltages into phase with each other at their point of application.

Television sweep oscillators may also use a saw-tooth driving voltage, similar to the voltage shown in Fig. 11. Note that it is precisely the manner in which the electron beam moves when the internal deflection voltage of the oscilloscope is employed. The output frequency of this generator changes linearly, as shown in Fig. 11, from the lowest to the highest frequency. When the 25 mc. frequency is reached, the signal is suddenly returned to 21 mc. again to start the slow, linear rise again. One such generator, the "Mega-Sweep" shown in Fig. 12, has an output frequency range from 50 kc. to 500 mc. on fundamentals. A maximum frequency sweep of 40 mc. is available, although this can be reduced to 30 kc. A portion of the saw-tooth voltage used to sweep the frequency can be obtained from the terminals on the front panel of the generator and used to synchronize the horizontal deflection system in the oscilloscope. Or we can use the sweep

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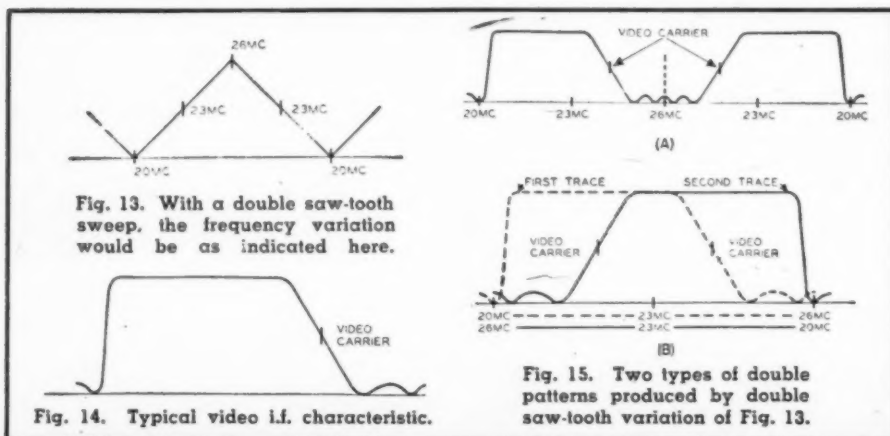


Fig. 13. With a double saw-tooth sweep, the frequency variation would be as indicated here.

Fig. 14. Typical video i.f. characteristic.

Fig. 15. Two types of double patterns produced by double saw-tooth variation of Fig. 13.

SELL YOUR SERVICE

By
JOHN B. LEDBETTER



A radio service shop may be gradually expanded to include service and sales of electric appliances.

Increasing your shop income is a matter of careful planning and the strategic handling of customers.

THE rapid strides which have been made in the past few years in u.h.f. communications, FM, television, and other phases of radio and electronics have been and will continue to be phenomenal. As a result, higher and more exacting standards have been placed on servicing technique and on selling technique. To meet these requirements the serviceman must adopt both immediate and long-range plans which will result not only in keeping his shop and test bench up-to-date, but will also encompass a continued broadening of his technical education, improvements in servicing methods, and the acquiring of a more advanced sales technique!

Since the radio service field is daily becoming more complex and more competitive than ever, it may well be that "survival of the fittest" will depend to a large degree on the serviceman's ability to sell. This means he must be able to sell more than a repair job—he must be able to sell convincingly his service and business methods—the major and minor points which make his service superior to that of his competitors. Above all, he must be able to sell himself!

The prime requisite for success in any business is a large number of satisfied customers. Perhaps the most effective formula in the entire service field (and certainly the most welcome) insofar as the serviceman himself is concerned, may be summed up as: $R_c/B_a :: C/S$, where R_c = cash register receipts, B_a = bank account, C = satisfied customers, and S = the

shop. Stated another way, it may be said that "the level of income is directly proportional to the number of active (satisfied) customers."

Before we analyze our service technique and business methods, it might be well to study some of the more basic points which are necessary not only in creating a satisfied feeling on the part of the customer at the way in which service on his set was performed, but in causing him to recommend your service to others. Years ago, Dale Carnegie wrote a highly successful book "How to Win Friends and Influence People." Perhaps you have read it. Suppose we borrow a bit from Mr. Carnegie and write our own set of rules. These, quite appropriately, could be listed under the heading of "How to Win Customers Who Influence People." Word-of-mouth advertising is one of the most effective methods of increasing your popularity and business income; take advantage of it. Do your utmost to see that your customers have good reason to use it. One satisfied customer may have direct influence on scores of new customers or prospects.

Now, let's find out what makes a customer satisfied. The number one reason, of course, is because you did a good job on his radio! But—that isn't all! Chances are, you know a half dozen servicemen who could have done the job equally well—in many cases, so does the customer! To make that customer remember you the next time his receiver needs attention, you must do a good job of selling yourself! Many times that part may be done

subconsciously, as far as you are concerned, but for lasting customer impression and repeat business it must be accomplished just the same. If you can influence the customer subconsciously, well and good, but most of us have to expend a good deal of conscious effort in order to turn the trick.

Here are some of the points a customer likes to remember: (1) a pleasing personality, (2) a neat, attractive shop, (3) honesty, (4) dependability, (5) straightforwardness, (6) politeness, (7) efficiency, (8) fair service charges, and (9) an atmosphere which makes him "feel at home." Note that a "pleasing personality" is listed as first in importance. This, along with a neat, clean shop, is the first thing the customer notices. Most of us have a tendency to make snap judgments; the customer is no exception. If your manner is disinterested, cool, or impersonal, the customer may go elsewhere next time. You may be worried or pre-occupied with a problem or wondering where next week's rent is coming from, but the customer doesn't know this. He instantly receives the impression that you'd just as soon not bother with him. Develop the habit of listening to his "troubles," no matter how unimportant or inconsequential they may seem. Display a personal interest in his problems. It isn't necessary to develop the bubbling enthusiasm of a Clark Gable or Van Johnson—just be yourself. This point brings up another of Mr. Carnegie's suggestions—let the customer do most of the talking. Intelligent listening not only reveals important personal traits of the customer which can be used to good advantage but also impresses him further.

In like manner, the first impression a prospective customer receives on en-

(Continued on page 114)

The RECORDING and REPRODUCTION of SOUND

By

OLIVER READ

Editor, RADIO & TELEVISION NEWS

IN OUR article last month we discussed many types of tone controls (equalizers) employing resistance and capacitance. Greater flexibility is had with the "resonant" type of equalizer, as it has been found from actual listener tests (see Fig. 1) that to obtain a balance between the low and high frequency response is highly desirable. For best performance, the product of the low frequency and high frequency limits of the equipment should equal approximately 500,000.

It has been established that where an audio system in a receiver was good to only 200 cycles at the low frequency and a tone control was necessary and when it limited the high frequency end to 2500 cycles the best balance of response was obtained. In the reproduction of phonograph records a similar condition exists, especially those records having a sharp drop-off at the low end. Accordingly, to obtain balance the high end frequencies are often removed unnecessarily. While the sound becomes balanced to the ear the fidelity is, unfortunately, greatly decreased. Low notes which were not reproduced originally are still not reproduced, and the high notes are missed as well. The obvious answer then is to bring back the low notes through the use of an equalizer, thus increasing the over-all fidelity rather than reducing it.

Virtually all recording systems, whether discs, sound on film, sound on wire, embossed film, etc., require playback equalization as well as equalization when the recording is being made. The necessity for equalization is apparent.

Most microphones, pickups and loudspeakers can be effectively equalized. Low frequency droop used for dialogue equalization will greatly improve the intelligibility of speech. It will also permit higher power levels from speakers used in p.a. equipment. A portion of the power normally going



United Transformer Corporation's
Type EG-1 interstage equalizer.

Part 21. Continuing the discussion of various means of audio frequency correction for specific applications.

to the speakers and not required for intelligibility is removed.

Mid-frequency equalization (low end and high end droop) is frequently used by radio amateurs to effect a maximum signal level in the frequencies most necessary for intelligibility. Various acoustic conditions will frequently lend themselves to equalization. For example, the absorption of high frequencies may easily be 15 db. depending upon the drapes in the room, the number of people, as well as the presence of any other sound absorbing material. Another point of equalizer use comes from the realization that at low sound levels the ear is less responsive to low frequencies. This type of equalization is commonly called "bass boost."

In order to obtain smooth and positive control and not introduce hum into the audio circuits it is advisable to employ commercially made equalizers such as the CGE-1 developed by U.T.C. engineers. Reference to the curves will show how well such units are suited to many applications. The electrical components are stable, free from hum pickup, and dependable in operation.

This type of equalizer is readily adapted for use with commonly used audio amplifier equipment. As mentioned, the frequency correction curve

with the RC type of tone control is a gradual slope and does not accomplish what is required in the boost condition. For example, if the circuit to be equalized is down 15 db. at 5000 cycles, an equalizer which brings back this 15 db. but also boosts 6 db. at 1000 cycles is not desirable. Accordingly, the CGE-1 unit employs resonant circuits for both the low and high frequency boost. As will be noted from the curves with 15 db. boost at 8000 cycles the response curve is flat at 2000 cycles. A similar condition exists at the low end. Two controls are required, one either boosts (accentuates) or drops (attenuates) the low frequencies and the other either boosts or drops the high frequencies. This type of equalizer is of high impedance and is designed for insertion into an audio amplifier between a triode plate and subsequent grid, or from a high impedance source (5000 to 30,000 ohms) other than a crystal microphone, to a subsequent grid loaded with 10,000 ohms.

Some insertion loss is effected by this equalizer, particularly at the maximum setting. If the amplifier system does not have excessive gain an additional audio stage may be required. As the filament and plate drain of the added tube is small, it

(Continued on page 157)

RADIO & TELEVISION NEWS

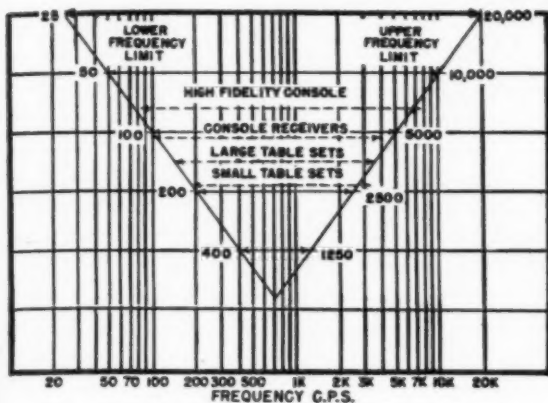


Fig. 1.

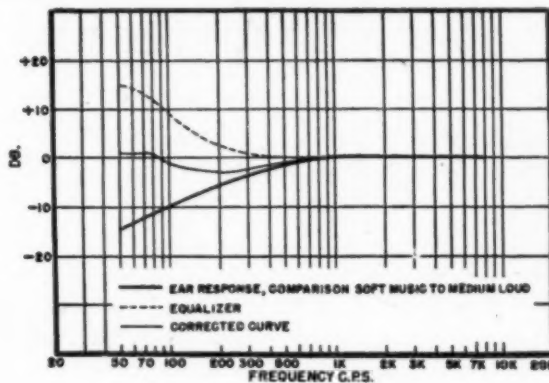


Fig. 2.

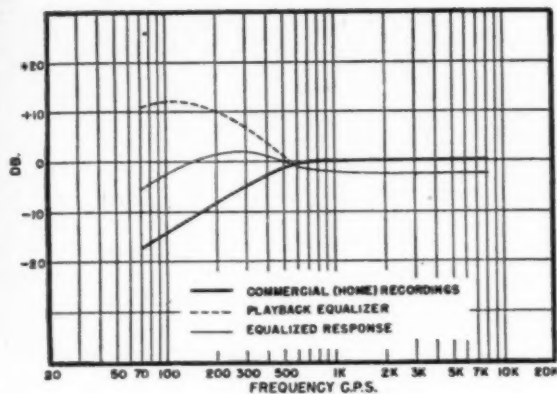


Fig. 3.

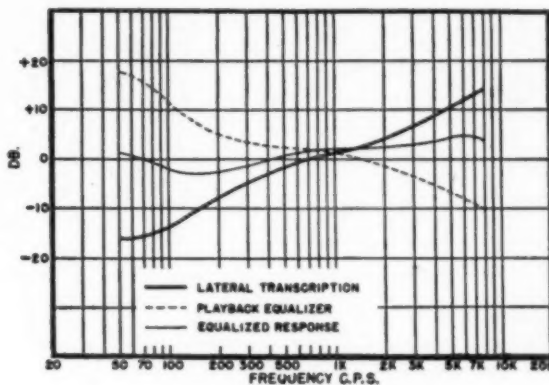


Fig. 4.

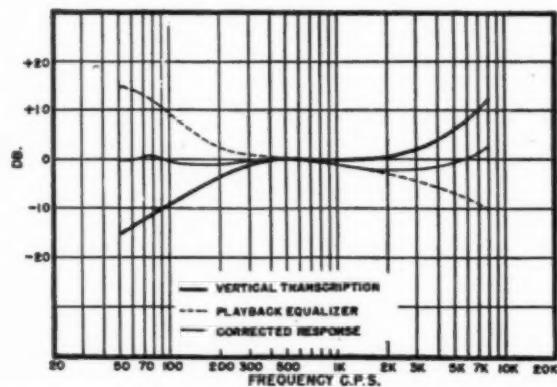


Fig. 5.

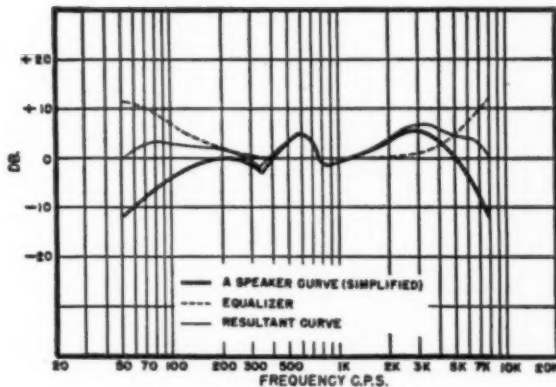


Fig. 6.

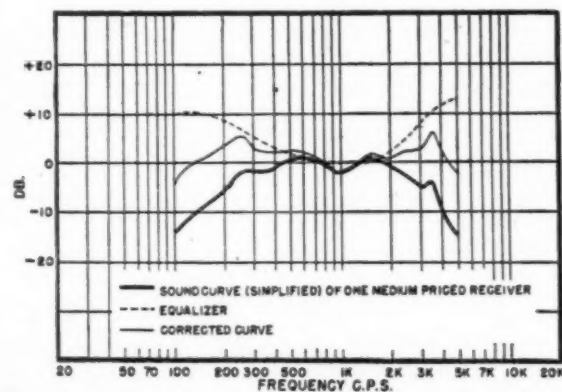


Fig. 7.

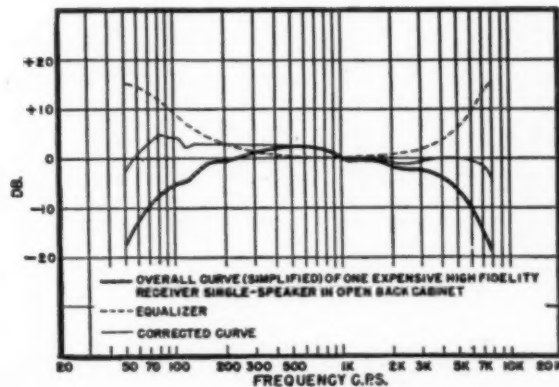


Fig. 8.



By
JOHN F. CLEMENS
W9ERN

Front and rear views of the home-built super. The oscillator is tuned by a National dial. Other panel controls are r.f. gain and mixer tuning.

An easily built three tube set for the beginning ham or as a spare receiver for the more advanced amateur.

ALTHOUGH this three tube superhet is not a substitute for a large commercial communications receiver, it can provide performance comparable to many of the smaller commercial models. If one is satisfied to forego such non-essential niceties as bandswitching, broadcast band coverage, and loudspeaker output, a small receiver of this type will be found in other respects equal to or better than a low-cost commercial model.

The stability of the receiver is quite good due primarily to the fact that a

large fixed capacity may be used across the oscillator coils since only the amateur bands are covered. Each amateur band is spread over approximately 80 degrees of the main tuning dial which tunes the oscillator. This amount of bandspread is ample for easy tuning and logging. Oscillator padding condensers are standard-value mica units mounted inside the tube-base coil forms. The oscillator is operated at the full plate voltage to provide sufficient oscillator power for good conversion gain in the mixer. No oscillator injection in addition to that

provided by the stray coupling is provided, thereby minimizing "pulling" of the oscillator frequency as the mixer is tuned. Even with this precaution the performance of the receiver is somewhat impaired by interaction of the mixer and oscillator controls on frequencies above 14 mc. On the lower frequencies the effect is negligible.

Images are practically non-existent on the 80 and 40 meter bands and much attenuated on the higher frequency bands. The high signal/image ratio is obtained because the separately-tuned mixer is tuned exactly to resonance rather than somewhere near resonance as is usually the case in the general coverage receiver. Also, the L/C ratio may be made optimum for high gain and selectivity since only a narrow frequency range need be covered. The triode plate detector, recognized as the quietest of tube mixers, has quite low input conductance enabling a high effective "Q" to be maintained in the input circuit. Capacity coupling of the antenna to the mixer grid may be criticized because of the resulting loading effect on the mixer grid circuit, but if a small capacity is used this type of coupling will give better results than others when short antennas are used. An auto antenna has been used with this receiver with excellent results operating from the car with a 67½ volt battery for "B" supply.

The entire receiver employs a 12AT7 dual triode as mixer-oscillator, a 6AK5 as an i.f. amplifier, and a second 12AT7

Winding data for coils covering the 80, 40, 20, and 10 meter bands.

Band	80	40	20	10
C _o	330 μ fd.	200 μ fd.	100 μ fd.	100 μ fd.
L ₁	12½ t. No. 26. Jumper from 5 to 7. Cathode tap (pin 8) 4 t. from gnd.	8½ t. No. 26. Cathode tap (pin 8) 4 t. from gnd. Jumper from 7 to 8.	5½ t. No. 26. Cathode tap (pin 8) 2 t. above gnd. Bandspread tap (pin 7) 1½ t. above gnd.	3½ t. No. 26. Cathode tap (pin 8) 1½ t. above gnd. Bandspread tap 1 t. above gnd.
L ₂	30 t. No. 26	17 t. No. 26.	9 t. No. 26.	5 t. No. 26.

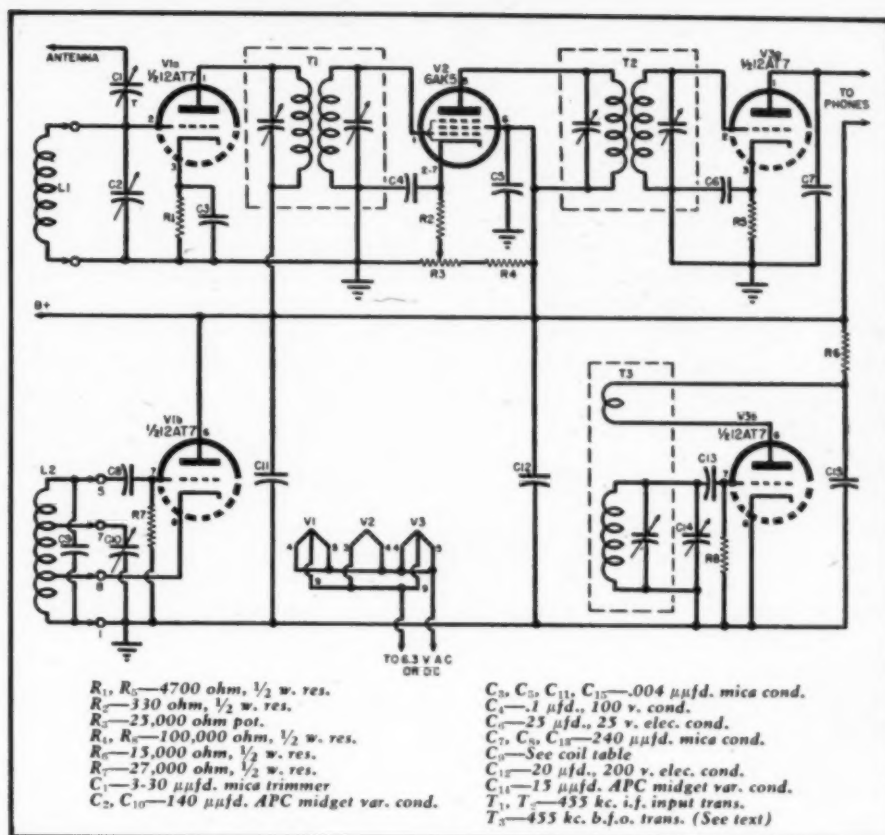
All coils ½" long, wound on octal GT tube bases, 1⅜" dia.

as second detector and beat frequency oscillator. The 12AT7 is a natural selection for its role because of its high gain and good high frequency performance, separate cathode connections and center-tapped heater permitting operation from a six volt filament supply.

The 6AK5 intermediate frequency stage gives a great deal of gain at 455 kc. If desired, a small amount of grid-to-plate capacity consisting of short lengths of wire connected to the grid and plate connections and twisted together may be added. If this capacity is adjusted until the i.f. amplifier is just on the verge of oscillation when the gain control is fully advanced, the regeneration obtained will greatly increase the selectivity and give single-signal reception similar to that obtained with a crystal filter. An "r.f." (actually an i.f.) gain control is provided and is to be preferred to other methods of control since the note of a c.w. station is unaffected by a change in the setting and a very wide range of control is obtained. The receiver is, therefore, suitable for monitoring one's own transmitter. The receiver gain is such that there is no necessity for operating at full gain all the time and most signals will give greater-than-comfortable headphone volume.

Following the i.f. is the second (plate) detector. This circuit has the advantage of providing amplification as well as detection without the resistive loading of the i.f. transformer secondary which occurs when a diode detector is used. Due to the lack of loading an "input" type of transformer may be used to drive the second detector without loss of gain and with an increase in selectivity over the usual closely-coupled "output" type of transformer.

The second half of the 12AT7 is the beat frequency oscillator. The knob protruding from one side of the receiver in the photograph is used to control the b.f.o. pitch. One of the rotor plates is slightly bent so that the condenser is shorted when fully meshed so that the b.f.o. may be turned off for the reception of phone signals. Although standard b.f.o. transformers are available, in this unit a standard i.f. transformer was modified to suit the purpose. Roughly two-thirds of the turns of one of the windings are removed and the trimmer condenser disconnected from this winding. In most transformers the windings are so phased that oscillation will occur if the usual color code is observed in connecting the leads from the transformer but if the b.f.o. does not oscillate it will be necessary to reverse the connections to the modified winding. An inch or so of hookup wire from the mixer grid to the vicinity of the b.f.o. pitch control will provide b.f.o. voltage injection of proper strength. This coupling should be adjusted by trial since too weak a b.f.o. signal will not give a loud audio beat on a strong signal while too strong a b.f.o. signal will drown weak stations in "hiss."



Circuit diagram of the compact three-tube communications receiver.

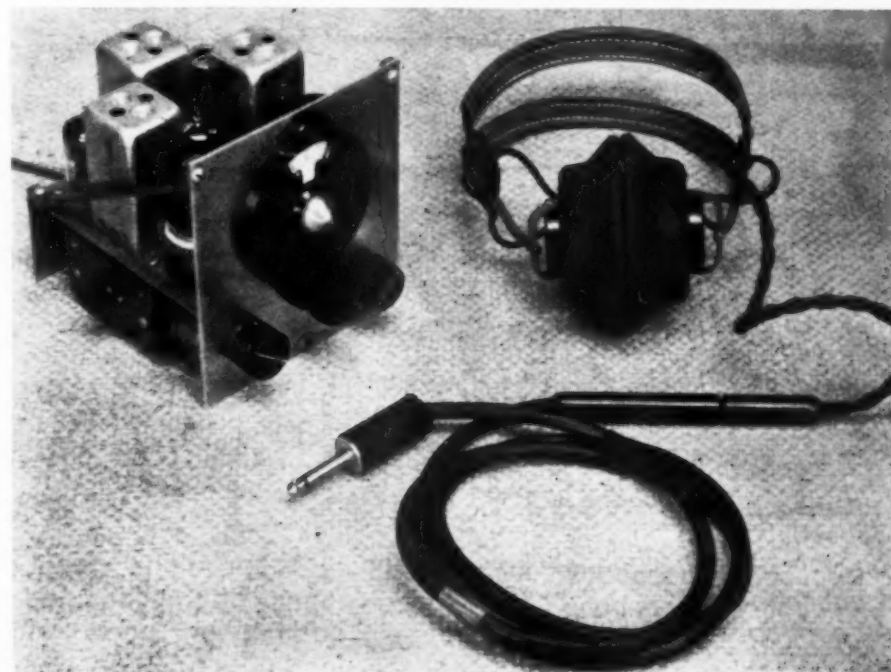
The receiver is constructed on a simple chassis approximately 4 $\frac{3}{4}$ inches square. Small braces from the rear of the chassis to the upper corners of the panel prevent "hinge" flexing of the panel and make the assembly quite stable. Of course, it is especially important that those components associated with the high frequency oscillator be mechanically

rigid if the receiver is to be electrically stable.

All coils are wound on bakelite bases from old GT octal tubes. C_9 , the oscillator padding condenser, is different for each band and is therefore mounted inside the oscillator coil and changed along with it. The turns of the oscillator coil may be squeezed

(Continued on page 156)

Compactness of set is apparent from this comparison with a pair of headphones. The shield can directly above the b.f.o. control knob contains the b.f.o. inductor.



New Trends in RECEIVER DESIGN

Part 4. The use of capacitive reactance tubes as a means of suppressing the scratch level when playing phonograph records.

By
W. WILLIAM HENSLEY
Howard W. Sams & Co., Inc.

MANY new features have been incorporated in postwar receivers for increasing the listener's enjoyment of recorded music. Among these innovations are new crystal pickups which require very little needle pressure, resulting in longer record life; several new magnetic pickups having an extended frequency range for better fidelity; special "knee action" type needles to reduce the output caused by vertical movement; and the increased production of Vinylite records making more selections available on these premium

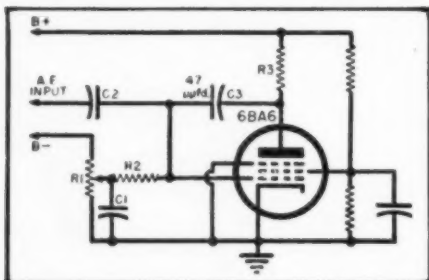


Fig. 1. A schematic of a stage in which the "Miller Effect" is achieved by means of a tube having pure resistance as a plate load.

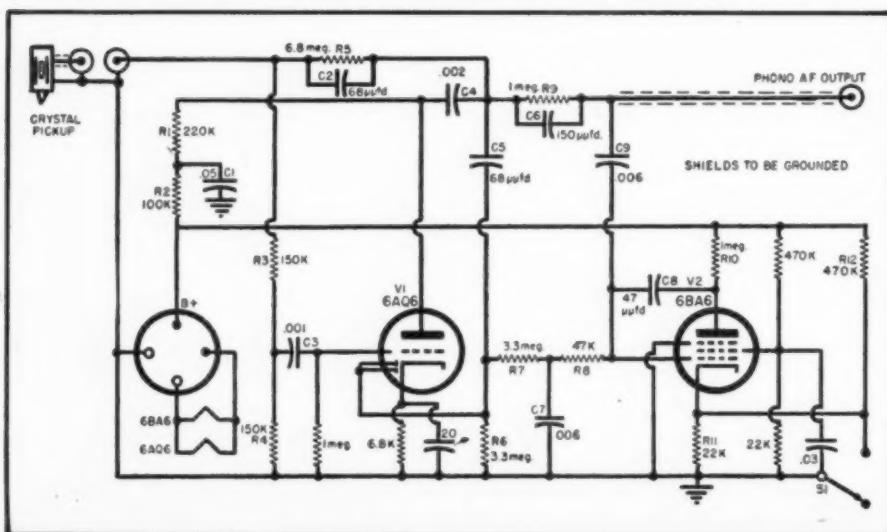
records. Many of the new record changers feature a fast, quiet change cycle with automatic shut-off after playing the last record. The use of semi-permanent needles in these changers, good for several thousand plays, has practically eliminated the need of needle changing which further lessens the task of playing recorded music. Even with all these features one thing still seemed to be lacking. This was a means of eliminating the scratch caused by slight imperfections in the records and the roughness which develops as the records become worn. A true high-fidelity amplifier will reproduce the scratch as well as the recorded music. Many enthusiasts of real high-fidelity music have trained themselves to accept a certain amount of scratch without objection in exchange for the added listening pleasure afforded by the extended range of reproduction. To others, however, this scratch or hiss is not only objectionable but is highly irritating to such an extent that the "highs" must be suppressed to reduce the scratch level. A device was needed to suppress the scratch level when no high frequencies were present but would quickly "open up" and allow the higher frequencies to pass when required. Although the scratch would also be passed as the device "opened up," it would be

"masked" to a certain extent by the high frequencies. Such a device would be an effective scratch eliminator and would allow the critical listener to enjoy high-fidelity reproduction with a minimum of scratch. Two such scratch eliminators, as employed by *Bendix Radio* and the *Philco Corporation*, are described in this article.

The speed with which the scratch eliminator must respond eliminates the possibility of using mechanical means for varying the capacity to shunt the signal and as a result a capacitive reactance tube is usually employed. The rapidity with which the effective capacity of this tube can be varied makes it very suitable for this application. A schematic of the scratch eliminator used in the *Bendix Models 1524 and 1525* is given in Fig. 2.

Tube types 6AQ6 and 6BA6 are employed. The 6AQ6 is used as an audio amplifier, its diodes being used to develop the bias voltage for the reactance tube. The 6BA6 is connected as a capacitive reactance tube. An audio signal from the pickup crystal is impressed across the voltage divider network, R_1 and R_2 . A part of this signal is coupled to the grid of the audio amplifier by C_1 . The signal is then amplified and coupled to the output jack through C_4 and the tone compensation network composed of R_3 and C_5 . It may be seen that the circuit thus far outlined is a conventional audio amplifier stage and, with the exception of the tone compensation network in series with the output, no frequency discrimination will be accomplished. To complete the scratch eliminator, the following components are added; a feedback network consisting of a $68 \mu\text{fd.}$ condenser (C_2) and a 6.8 megohm resistor (R_5) coupled from the output of the audio amplifier back to the input to provide a certain amount of degeneration for the high scratch frequencies; and, a $68 \mu\text{fd.}$ condenser (C_3) coupling the signal back to the diodes, where it is rectified. Due to the low capacity of C_3 , only the high frequency signals will be coupled to the diodes since the reactance of C_3 will be high for any low frequencies. The 6AQ6 is self-biased with approximately two volts on its cathode. Since the diode load resistor (R_4) returns to ground, this two volts bias acts as a

Fig. 2. Schematic of scratch eliminator used in the Bendix Models 1524 and 1525.



source of delay voltage. Thus, when the frequency is high enough, C_1 , due to its low reactance, will couple enough signal to the diodes to overcome the delay voltage. It is also interesting to note that, during low level passages, the amplitude is too low to overcome the delay bias and no rectification takes place, even in the presence of high frequency signals. This is normal operation since the passing of the higher frequencies would also allow the scratch to be passed. Since the recorded signal is at a low level, the scratch would actually mask the signal, and the reproduction would be lost in the scratch. This operation would have the effect of an intermittent hiss and would be very objectionable. The rectified diode current flows "down" through the diode load resistor (R_1) giving a negative polarity at the top. This voltage is then filtered by the RC network R_2 and C_1 . The voltage across the condenser C_1 is applied to the grid of the reactance tube and controls the transconductance of the tube. It is well to point out that the charge path for C_1 is through the diodes and R_1 , while its discharge path is through R_2 and R_3 . The resistance of the diodes can be disregarded since it is so low compared to the 3.3 megohm resistor (R_1). Resistor R_2 is equal in value to R_1 , making the discharge time of C_1 twice as long as the charge time. Although this slower recovery time would seem very objectionable, the discharge path of C_1 is found to have a time constant of approximately .4 second. This is quite fast and only on badly worn records is there a noticeable hiss following the high frequency notes. As stated previously, the voltage across condenser C_1 is impressed on the grid of the reactance tube. The audio signal is also coupled to the same grid through condenser C_2 . The purpose of resistor R_3 is to isolate the audio signal from C_1 , which has enough capacity to shunt or attenuate the higher frequencies of the audio signal. In order to understand the operation of the complete circuit, a thorough knowledge of the theory for this particular type reactance tube is required. Therefore, a review of this theory follows.

The Miller Effect

Since both the "scratch eliminator" circuits described in this article use capacitive reactance tubes, only those types will be discussed. In more elaborate units inductive reactance tubes or a combination of both types may also be used. Although the stage used to vary the capacity, which shunts the audio signal, has heretofore been referred to as a capacitive reactance tube, actually the "Miller Effect" of a tube having a pure resistance as a plate load is employed. A schematic of such a stage is given in Fig. 1.

The input impedance of a tube having any plate load varies as the transconductance of the tube is changed. This effect is known as the "Miller

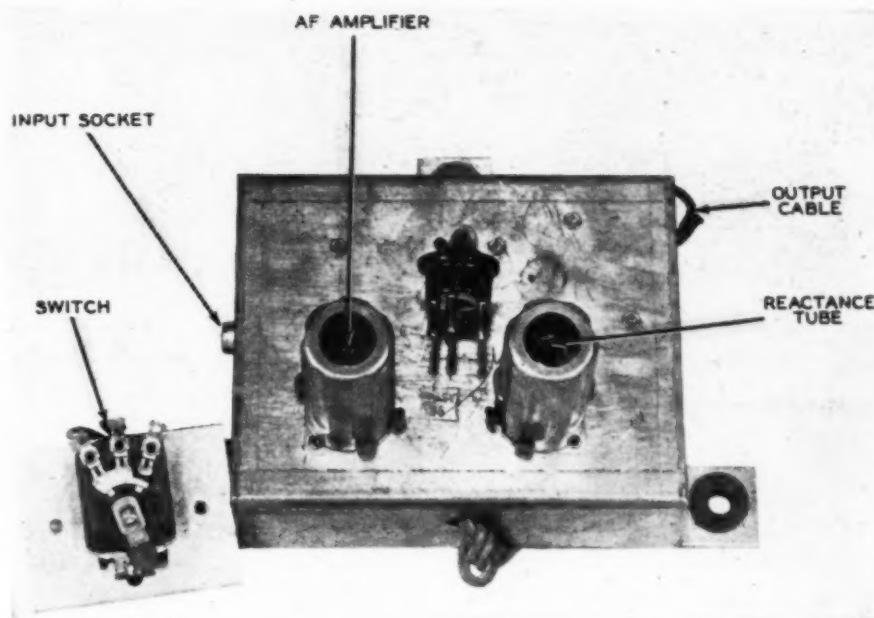


Fig. 3. Bendix scratch eliminator unit, constructed on a separate chassis.

Effect." If a pure resistance is used as the plate load, the input impedance will be purely capacitive. If a reactive component is used as a plate load, the input impedance will contain a resistive component. As can be seen in Fig. 1, the resistor R_3 constitutes a pure resistive load and results in a capacitive impedance at the input grid.

The manner in which the input impedance can be changed by varying the transconductance of the tube can be more clearly understood by considering the charges existing on the tube elements. The charge on any condenser is expressed by the formula $Q = CE$ where C equals the capacity and E equals the voltage applied on the opposite plates of the condenser. The charge on the grid of a tube, due to the grid-cathode capacity, may be found by multiplying the signal voltage by the grid-to-cathode capacity. Note that this charge will change according to the amplitude of the input signal, but it is not dependent on the transconductance of the tube.

The charge existing between the grid and plate will vary as the gain of the tube is changed. This can be seen by calculating the output voltage on the plate. The output voltage is found by multiplying the signal voltage by the gain of the tube; $E_{out} = E_{signal} \times M$ where M equals the gain of the stage. Since we are calculating the voltage between the grid and plate and the grid voltage is 180 degrees out of phase with the plate voltage, the potential difference must be found by the quantity: $E_{signal} \times (M+1)$. Thus, the formula for the charge on the grid due to grid-to-plate capacitance is: $Q_{gp} = E_{sig.} \times (M+1) \times C_{gp}$. Since the charge on the grid, due to the grid-to-cathode capacity, is not dependent on the gain of the tube it can be added to the effective grid-to-plate capacitance. Then the entire input capacity can be

calculated by the formula: $C_{in} = C_{gk} + C_{gp} \times (M+1)$. Although the input capacity will be increased many times due to the "Miller Effect," it is still low due to the low grid to plate capacity of the 6BA6 tube and in fact, it is much too low to be useful at audio frequencies. Referring again to Fig. 1, it can be seen that a 47 μ fd. condenser (C_2) has been added between the plate and grid to materially increase the grid-to-plate capacity.

Resistor R_1 in Fig. 1 is shown as a variable control so that a varying bias may be applied to the tube. This bias compares to the voltage developed by the current flow in the diodes across R_2 in Fig. 2. By varying the setting of resistor R_1 , the gain of the stage may be controlled. As the arm of the control is advanced the gain is decreased and reversing the motion increases the gain. Let us assume that the arm is moved up enough to apply cut-off bias to the tube. By referring to the formula: $C_{in} = C_{gk} + C_{gp} \times (M+1)$, we find that the input capacity will be the sum of C_{gk} and C_{gp} only since M (gain) equals zero. However, if the arm were set to the point where a gain of 100 could be realized, the input capacity would be approximately 5750 μ fd. The grid-to-plate capacity in this calculation is 47 μ fd. because of the addition of C_2 between the grid and plate. This input capacity is large enough to shunt the higher audio frequencies and the effective capacity of the stage can be controlled.

Referring again to Fig. 2, the operation of the scratch eliminator can be summed up as follows. During the low level passages or during the absence of high frequencies, there is insufficient voltage coupled to the diodes to overcome the delay voltage and there is no rectification. Since there is no current flow in resistor R_2 the gain of the reactance tube will remain at maximum. This results in maximum

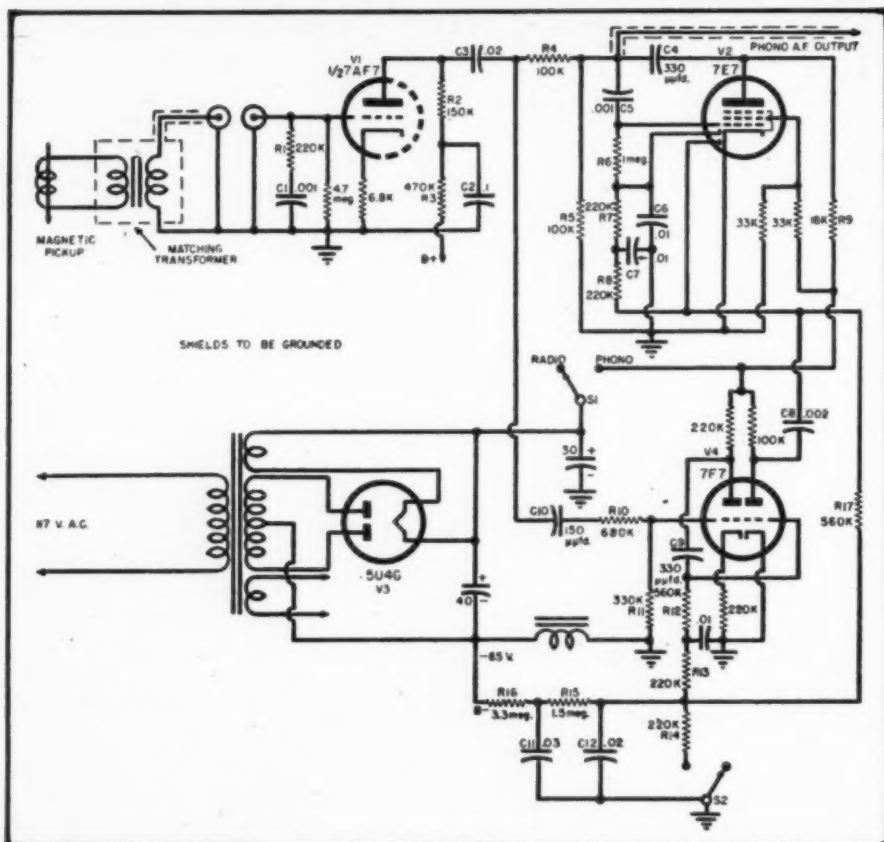


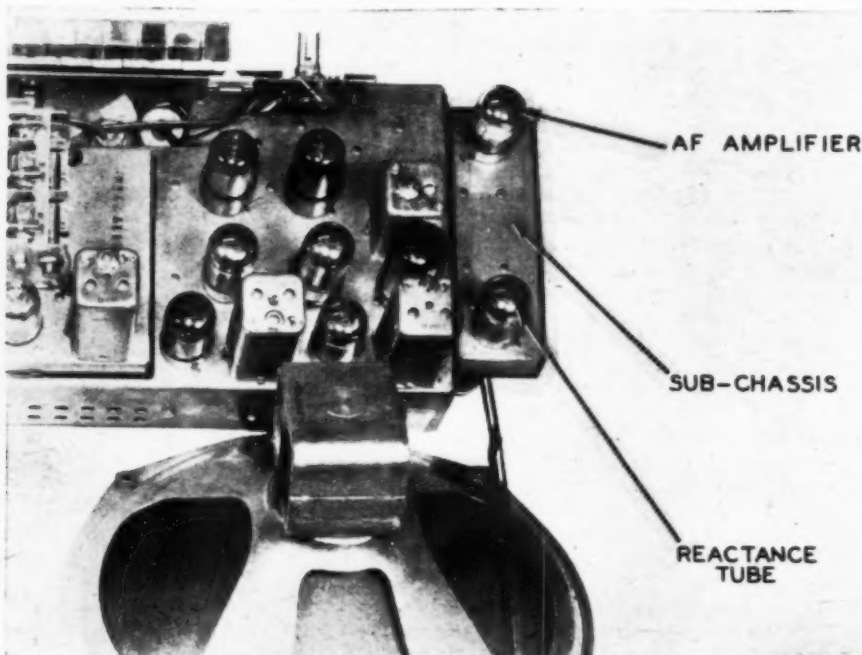
Fig. 4. The scratch eliminator as used in the Philco Model 48-1270 unit.

input capacity and a shunting of the audio signal. If, however, there is sufficient signal to overcome the delay voltage, rectification will take place. The current flow in R_4 will decrease the gain in the reactance tube and the input capacity will decrease. This decrease will allow the higher frequencies to pass. Although this action has been described as a chain of events, it should be borne in mind that this

shunting effect is constantly changing resulting in good reproduction of the recorded music with a minimum of surface noise.

The eliminator unit shown in Fig. 3 is constructed on a separate chassis. The phonograph pickup cable plugs into the input socket and the output of the unit plugs into the phono socket of the receiver or amplifier. Although Bendix builds this unit into several of

Fig. 5. Schematic of the scratch eliminator used by Philco in the Model 48-1270.



their models, this unit can be installed in some of their earlier models with a minimum of changes. The switch shown in the photograph and as shown in Fig. 2 is for the purpose of disabling the unit. With the switch open, current flowing through the bleeder network R_{12} and R_{11} biases the reactance tube to cut-off and there is a minimum of shunting on the audio signal.

A schematic of the scratch eliminator used in the Philco Model 48-1270 is shown in Fig. 4. A portion of the power supply is illustrated to show how the negative bias is obtained for disabling the circuit when not being used. A portion of this voltage is also used for fixed bias when the circuit is operating. This particular receiver uses a magnetic pickup which is coupled to an impedance matching transformer. The output of this transformer is fed to a triode which is one-half of a 7AF7 tube. A bass boost network composed of R_1 and C_1 has been connected in the grid circuit of this tube. The output of this stage is coupled by condenser C_2 to a voltage divider composed of R_4 and R_5 . The output is taken from the junction of these two resistors. The audio signal is also coupled to the grid of the reactance tube from this point by condenser C_3 . The total signal across the voltage divider network is coupled to the 7F7 amplifier stages by condenser C_{10} . The capacity of C_{10} is low (150 $\mu\text{fd.}$) and offers a high impedance to the low audio frequencies. The higher frequencies are coupled to the voltage divider network, R_{10} and R_{11} , from which only about a third of the signal is fed to the grid. The output of this stage is then coupled to the next stage, again through a small capacity to attenuate the lower frequencies. This stage has fixed bias which is taken from the negative return of the power supply. This voltage is well filtered by the RC filter network R_{16} , C_{11} , R_{18} and C_{12} . With the switch S_2 closed, which is the "on" position, approximately three volts of minus polarity is applied to the grid. This bias voltage is also fed to the reactance tube through R_{17} . A type 7E7 tube is employed as a reactance tube. One of the diodes is used to rectify the audio signal coupled from the plate of the last section of the 7F7 by C_6 . The negative three volts is also applied to the diode as a delay bias to prevent rectification during low level passages. The current flow of this diode is "down" through R_{17} which increases the bias on the reactance tube. This bias voltage is filtered by the RC network R_6 , C_7 , R_7 and C_8 . A 330 $\mu\text{fd.}$ condenser (C_4) has been added from the plate circuit to the grid circuit of the reactance tube to increase the grid-to-plate capacity of the tube which is very low when connected as a pentode. As the gain of the 7E7 pentode section is varied the input capacity of the tube will change. This varying capacity shunts the audio signal and filters the scratch.

The operation of this circuit is as
(Continued on page 102)

An Inexpensive "LADDER" TYPE MAST

A low-cost support capable of carrying a 20 meter rotary beam. Total cost of parts amounted to \$7.50 or about 30 cents per foot.

By

NICHOLAS LEFOR, W2B1Q

AFTER it was decided that a rotary beam was a "must" in our present location, the next step was to select a mast, pole, or tower to support the beam.

Upon consulting available handbooks, and back issues of all the popular amateur magazines, no structure could be found that would suit our particular purse or purpose.

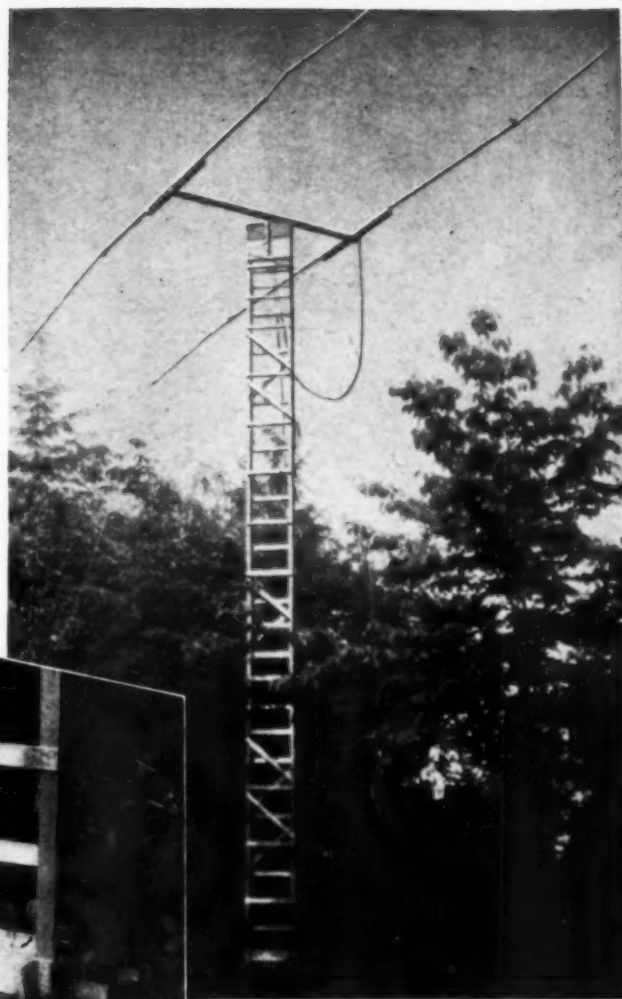
While a telephone pole looked like the ideal solution, an asking price of approximately two and one-half dollars per foot in our vicinity dictated a bowing out in favor of the purse. "A" frames and "T" masts, standards in mast construction, not only wouldn't support the beam, but for the length required (approximately 30 feet) the price appeared exorbitant for its purpose.

The purpose was to support a beam, but must also permit climbing the structure, mounting the 20 meter beam, and making necessary adjustments.

It should approximate a half wave height at the operating frequency, and should be simple to construct and erect.

To accomplish the foregoing purposes a ladder type structure was decided upon and this decision was followed by a visit to the local lumber yard.

Since 24 foot 2 x 4's are now available, 2 lengths of 24 foot 2 x 4's, 100 feet of $\frac{3}{4}$ x $1\frac{1}{2}$ furring strip and 3 pounds of $1\frac{1}{2}$ " long headed nails were purchased. Total price of the material amounted to \$7.50 or approximately thirty cents per foot. Several of our requirements had now been met, namely an approximate height of a half wavelength on 20 meters, and sufficient change from a ten dollar bill



Two views of the completed antenna mast. Ladder-type steps provide easy access to top of unit for mounting and adjustments. Details for bracing the base are shown in closeup of mast in photograph at left.

to purchase appeasement for the "XYL" when she sees the mast on the front lawn.

With the aid of only a hammer and saw, the structure as shown in the diagram was constructed in the matter of several hours. The two 2 x 4's were laid on edge and parallel 18" from outside to outside. About 50 pieces of furring strip, 18", were cut and nailed across the 2 x 4's every 18 inches.

This was repeated on the opposite side of the 2 x 4's but were displaced 9" as indicated in the diagram. Cross braces were nailed and trimmed in several places as indicated in the photographs to eliminate possible side swaying of the 2 x 4's. In addition several scrap pieces of 1" x 6" boards were nailed to the top of the ladder. This was done to accommodate the bearing pipe for the beam.

The location for the ladder mast was selected and a footing constructed by driving several 2½ foot pieces of furring strip into the ground about 1½ feet deep and 2 feet apart. To this were nailed several more pieces of

scrap wood and a base of 4" wide by 2 feet long wood strip.

The foot of the ladder mast was placed at this footing, and with the ladder mast lying on the ground, 3 guy wires, 120 degrees apart were attached at the top, and strung to their respective tie points, allowing sufficient slack so that the mast could be raised to a vertical position without the guy wires snagging.

Incidentally at this point, the length of guy wires required may be figured out quite accurately if one dusts off his high school trig books.

While the mast was moved around during all these operations by the author, the point was now reached where the aid of several neighbors had to be enlisted to raise the mast to a vertical position.

With the aid of the footing already described, it was a simple matter of heave and the mast found itself, as the author thought anyway, pointing majestically skyward.

With the mast in this position the three guy wires were fastened evenly
(Continued on page 160)

Mac's RADIO SERVICE SHOP

By JOHN T. FRYE



BARNEY PLAYS "TWENTY QUESTIONS"

THE November morning was overcast, and there was a cold damp wind blowing the scattered leaves about the streets; but this had no effect on Barney's cheery whistling as he stepped into Mac's Radio Service Shop and found Mac already at work at the bench.

"The top of the morning to you, Boss," he greeted as he hung up his jacket and slipped into a shop coat. "What great electronic problems await my solving this morning?"

"Well, if it is not asking too much of you, Marconi the Younger, you might put a new output transformer in that set on the other end of the bench."

Barney, still whistling, went to work removing the old output transformer from the speaker. Mac, who was working on a wire-recorder-receiver combination, switched the output of the signal generator into the signal tracer so that the 400 cycle note came clear and strong through the speaker; and then he said to Barney, who was getting in some very hot licks on *The Whistler and His Dog*, "Would you mind muzzling that dog for a couple of minutes while I get this audio oscillator on the wire?"

Barney remained mute while Mac put about three minutes of the 400 cycle note on the wire through the microphone, but the instant the "rewind" switch was snapped, he burst forth with, "Why are you doing that?"

"The complaint on this outfit is that music does not sound good on it, although voice seems to be natural. I feel confident the trouble is caused by 'wowing' as a result of uneven pulling of the wire. The quickest way to detect a condition like that is to listen to a

sustained note of unvarying pitch that has been recorded. If the speed of the wire changes this will show up as a change in frequency of the recorded note. Catch?"

"I catch," Barney said; "but why doesn't it affect the voice recording?"

"It does, but because the voice is continually changing frequency itself, it is harder to detect this kind of distortion with speech on the wire."

"It seems to me that if the wire changed its speed during the playback exactly as it had during the recording, you would not notice anything wrong."

Mac's face wrinkled into the pleased grin that a shrewd observation on the part of his apprentice always evoked. "You are exactly right; but since this change in speed is caused—I think—by slippage in the drive mechanism, it would be a very rare coincidence if those changes were in step."

The recorder was switched to "Play Wire," and the audio note came through with a rhythmic rise and fall of frequency that clearly indicated the inspiration for that term "wowing."

"Now that you are sure you guessed right, what are you going to do about it?" Barney wanted to know.

Without replying, Mac loosened a jam nut on the back of the frame of the wire-transporting motor and carefully adjusted the screw that this freed. As he did so, the note improved, although there was still some deviation. Once more he recorded the 400 cycle note, and this time when it was played back, it came through as clearly and as unvarying as it had come from the speaker.

"That adjustment, which is a ticklish one, regulates the 'motor torque,'" Mac explained. "If it is a little too loose, there is some slippage, and the wire is pulled unevenly, both on 'Recording' and on 'Playback.'"

"What if it is too tight?"

"When you change from 'Rewind' to 'Playback,' the reversal is so abrupt that the wire is broken. Usually, though, the change due to wear is toward the 'too loose' direction, and about a quarter of a turn of that adjusting screw in a counter-clockwise direction will take the 'wow' out."

While Mac was putting the wire-transporting mechanism back in the recorder case, Barney installed a new "universal" output transformer on the speaker frame and connected the primary winding. Then he looked into the service manual to see what the impedance of the voice-coil was so that the proper taps of the secondary could be used, but the information was not given.

"Hey, Mac, how am I going to match the transformer to the voice-coil impedance when I don't know what the coil impedance is?" he asked.

"We use the one-string fiddle for that," Mac told him gravely.

"The what?"

"The one-string fiddle," Mac repeated as he opened a cabinet and took out a narrow piece of wood about a foot and a half long with a slender wire stretched along the length of it (See Fig. 1). One end of the bare wire went beneath a binding post, and there was another binding post at one side of the little board with a flexible lead terminating in a tiny battery clip attached to it.

"That thing looks as though it would suck eggs," Barney muttered. "How can it help in finding the voice-coil impedance?"

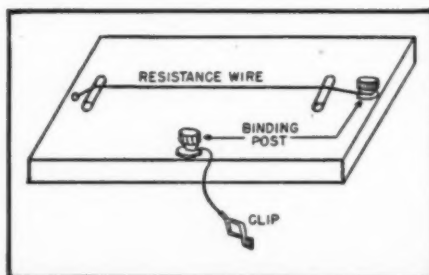
"Just watch, impatient little man, and you will see," Mac said as he switched on the v.t.v.m. and brought a couple of leads from the audio output of the signal generator and clipped them across the volume control.

"That wire is resistance wire, and there is about twenty ohms' worth of it there. I am placing this simple rheostat—for that is what it really is—and the voice-coil in series across any two convenient taps of the output transformer, like this": and he sketched Fig. 2 on the blackboard at the end of the bench.

"Now I attach the ground lead of the vacuum-tube voltmeter to point B and check the audio voltages that

(Continued on page 161)

Fig. 1.

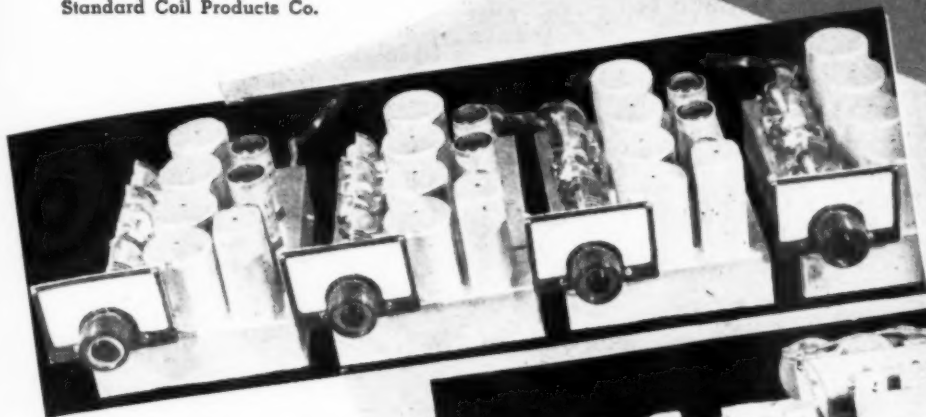


Build Your Own COMMUNICATIONS RECEIVER

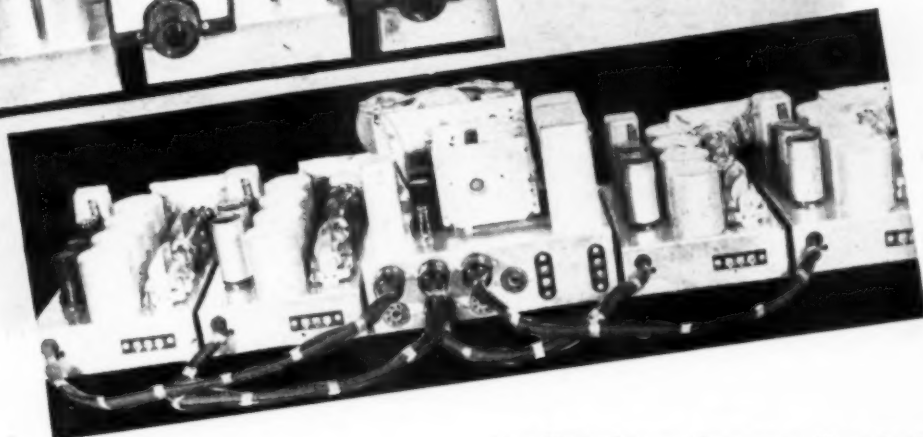
By

J. T. GOODE

Standard Coil Products Co.



Front view of the four tuners. With the exception of circuit changes, all chassis are alike.



Rear view of the tuners. The all-wave tuner, covered last month, is shown in the center.

Part 4. Complete details on the 75, 40, 20, and 10 meter r.f. tuners. They are all built on individual chassis and are identical in construction. Previously covered were power and audio assembly, the i.f. channel, and all-wave tuner.

"V K3BN from W6XYZ, sorry OM but the noise level is above your signal level." How many of your DX contacts end with the above comment?

Noise can be classified into two types, noise generated in the receiver or noise picked up by the antenna. The latter type of noise can only be eliminated at the source. Noise generated in the receiver may be reduced to a minimum by adequate engineering design.

Every amplifier stage in a receiver is capable of creating noise. A high gain amplifier stage will produce more noise than a low gain stage. A pentagrid converter will produce more noise than a triode converter but the gain of the triode converter is low compared to the pentagrid stage. Any amount of regeneration will increase the noise level.

It becomes immediately apparent that if a receiver is to have a high signal-to-noise ratio (25 to 1), the gain per stage will be adjusted in favor of signal-to-noise ratio rather than

maximum gain, the other requirement being that regeneration be completely eliminated.

The r.f. tuners described in this article were designed around the following specifications:

1. Adequate gain with a signal-to-noise ratio of 25 to 1.
2. Readily obtainable parts that are available at most radio stores.
3. Mechanical and electrical design such that anyone with a basic knowledge of radio can construct the tuners and be assured satisfactory operation.

The operating characteristics of a receiver are normally measured using the following procedure.

A known signal level measured in microvolts is fed into the antenna input circuit. The signal generator is modulated at a level of 30 per-cent. An output meter calibrated in milliwatts is connected in place of the loudspeaker. A reference level of 50 milliwatts is used. The volume control of the receiver is rotated to maximum output.

The output of the signal generator

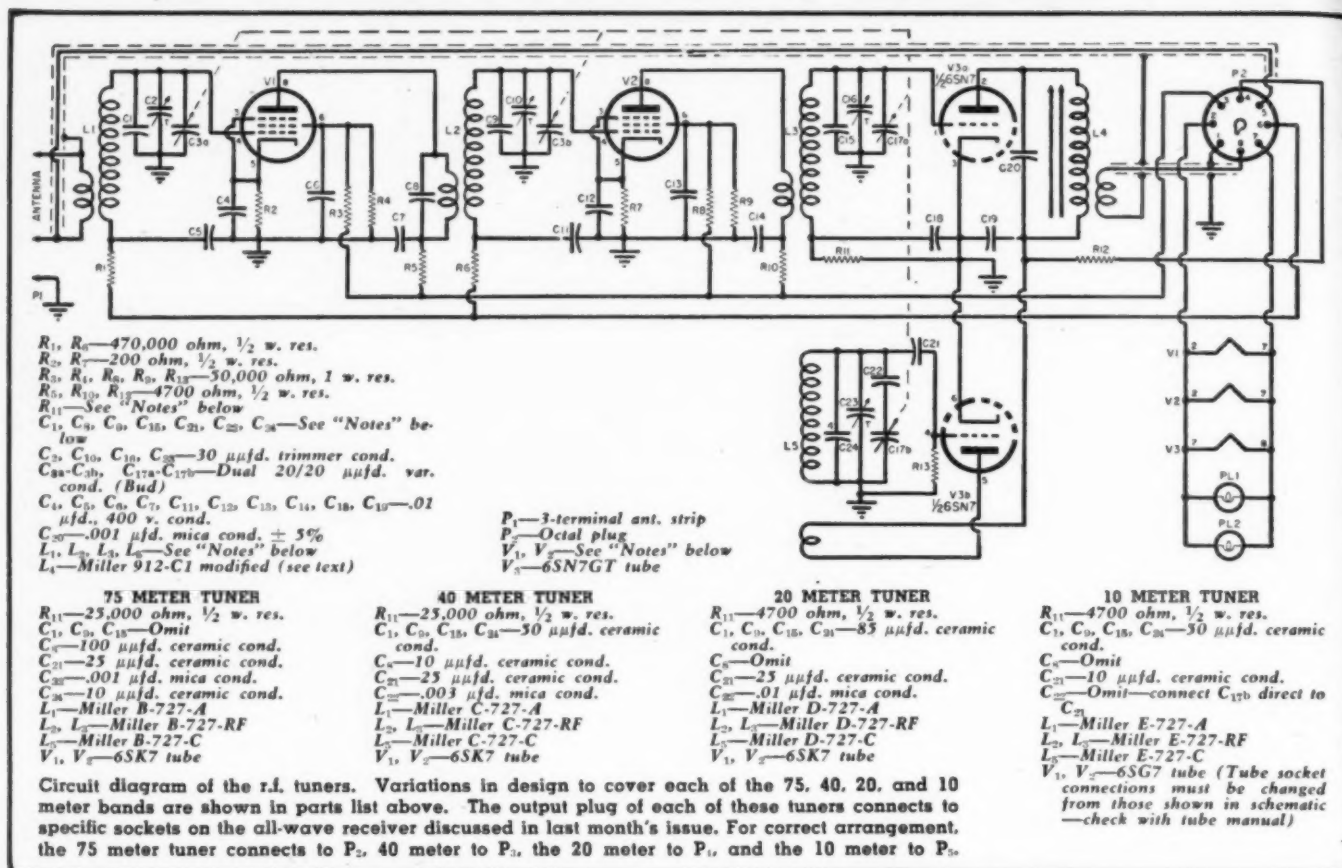
is adjusted to produce an audio output level of 50 milliwatts. The signal generator modulation is then turned off and the difference between the output levels is the signal-to-noise ratio. The microvolt level of the signal generator indicates the sensitivity of the receiver.

A signal-to-noise measurement without a sensitivity measurement is meaningless, likewise a sensitivity measurement without a signal-to-noise measurement is also meaningless.

Some communication receivers have such a poor signal-to-noise ratio that the previously outlined method of measurement cannot be used. With the antenna terminals shorted and the volume full on, the audio output will be on the order of two or three watts instead of one or two milliwatts. This is due to the noise generated in the receiver.

To make measurements on such a receiver it is necessary to reduce the audio gain control until the noise level is reduced sufficiently to make measurements.

It is common practice to consider a receiver capable of receiving a one microvolt signal as a "hot" receiver. If the signal-to-noise ratio is two-to-one or less (which is not uncommon), the fact that one microvolt can be heard does not mean that satisfactory reception is possible at a one microvolt level. Since one half of the audio output is noise it is doubtful that a



signal could be copied under such conditions.

By reducing the audio gain control and increasing the input so that a ten-to-one signal-to-noise ratio is obtained, the sensitivity of the receiver may be in the order of ten microvolts.

A ten-to-one signal-to-noise ratio will produce satisfactory reception but the noise level will be readily noticeable.

All measurements made on the equipment described in this article were obtained with a Ferris 18 C signal generator and a General Radio Model 583-A audio output meter. This equipment is considered satisfactory for making accurate receiver measurements.

Tuner Design

The difference in expense and effort between building just another tuner or a tuner of above average characteristics is not great. In line with the design of the rest of the receiver, the design of the r.f. tuners is such to equal or exceed operating characteristics of any receiver now on the market.

To obtain adequate sensitivity and satisfactory image rejection, two r.f. stages are used. With more than adequate gain available the gain of each stage can be reduced below normal, resulting in excellent signal-to-noise conditions and complete elimination of regeneration.

Designing in favor of signal-to-noise ratio dictated the selection of the triode converter. A separate triode is used for the oscillator. This type of

design is far superior to the pentagrid converter. The stability of the oscillator is greatly improved since the two circuits are independent of each other.

The tuning range of each tuner is restricted to a particular band of frequencies. This results in practically perfect tracking.

All the coils are stock items. The i.f. line transformer is a stock item but requires modification to match the lower plate impedance of the triode converter.

Image rejection ratios decrease as the frequency is increased. At 4000 kc. one r.f. stage will produce a greater image ratio than two r.f. stages at 30,000 kc. One r.f. stage operating at 30,000 kc. may have an image ratio of only 15 to 1. In this case the receiver is capable of receiving distant stations on the image frequency and local stations cause serious interference.

If the intermediate frequency is increased the image ratio will increase. High frequency i.f. channels decrease selectivity which is undesirable in a communications receiver. The use of the double superheterodyne principle is a more satisfactory method of obtaining high intermediate frequencies without sacrificing selectivity.

When two r.f. stages are used satisfactory image rejection up to 30,000 kc. can be obtained with an intermediate frequency of 455 kc.

The tuned circuits of the r.f. amplifiers determine the image rejection of a receiver. Receiver coils are normally designed for a specific application.

The important design factors are frequency coverage, coupling, "Q," and mechanical construction for stability and shielding.

The writer does not advocate that inexperienced radio enthusiasts wind their own coils for the equipment to be described. Coil design requires adequate test equipment, and "know how" which the builder may lack.

To offset the coil difficulties standard Miller coils are used throughout. The circuit is designed around these coils eliminating the necessity for further design by the builders. Other coil manufacturers also make coils satisfactory for this purpose.

The circuit is identical for all four tuners. Parts that differ between tuners are outlined in the circuit diagram. The chassis, parts layout, and wiring are identical in each tuner.

Condenser C_3 is used only on the 75 and 40 meter tuners. This condenser reduces the gain of this stage and is adjusted for a maximum signal-to-noise ratio. If the coupling of coil L_4 was adjustable the coupling could be reduced which would be a more satisfactory method of reducing the gain. The use of the condenser means the builder can use the standard coils as is.

The i.f. coil is a Miller 912-C1 modified in the following manner. The plate impedance of the triode mixer is considerably lower than that of a pentagrid converter. The Miller 912-C1 is designed to match the plate circuit of the pentagrid converter.

Remove the coil from the can. Cut the bottom winding out but do not dis-

turb the coil form. Remove the shunting condenser from the terminal board. The top winding is also shunted by a condenser. Remove this condenser.

Next remove 150 turns from this top winding and reconnect the lead to the terminal board. Wind five turns of number 36 or larger wire around the coil form next to the top winding and connect the leads to the bottom terminals of the terminal board.

Condenser C_{20} tunes this winding to 455 kc. and has a capacity of .001 μ fd. plus or minus 5 per-cent. This condenser should be mica or ceramic.

The chassis is made of one sixteenth-inch aluminum and the corners are soldered. Steel chassis can be used. The layout provides short grid and plate leads.

The frequency determining condensers C_1 , C_9 , C_{16} , and C_{24} should be ceramic or silver mica. Low frequency mica condensers will not give satisfactory operation on the ten meter tuner.

The circuit diagram indicates definite pin numbers for each cable connection. These numbers correspond to the socket connection of the all-wave tuner described in the October issue of RADIO & TELEVISION NEWS.

Refer to the circuit diagram of the all-wave tuner for connections to these sockets. The wiring can be simplified by wiring P_1 first, P_2 second and so forth.

The shield is grounded at the plug end only. Cut the shield back on the switch end of the cable to a desired length. Cover the bare shield with scotch tape so there is no danger of the exposed shield making contact with some other electrical circuits.

Ground lugs should be mounted under the socket mounting screws of all tuner power sockets on the number one pin end. Solder a piece of bus bar wire from this ground lug to number one pin of each socket. The shield of the low impedance and antenna leads ground to this bus bar.

The frequency range of each tuner is as follows.

75 meter tuner—1500-4500 kc.
40 meter tuner—3750-11,000 kc.
20 meter tuner—8500-23,000 kc.
10 meter tuner—12,500-36,000 kc.

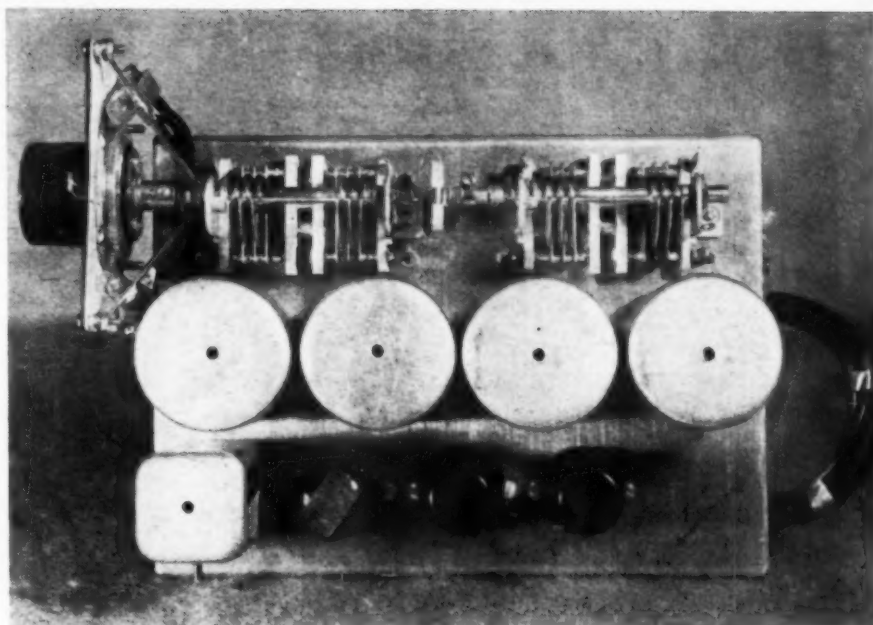
The frequency coverage of each tuner is restricted by the capacity range of the main tuning condenser. The frequency determining condensers shown in the circuit diagram are the correct value for each ham band.

Those desiring frequency coverage other than the ham bands can do so by changing the frequency determining condensers. The main tuning condenser capacity can be changed to increase or decrease bandspread on the dial.

The main tuning condenser has a capacity change of 20 μ fd. per section giving a frequency coverage for each tuner as follows.

75 meter tuner—3500-4000 kc.
40 meter tuner—6900-7350 kc.
20 meter tuner—13,950-14,600 kc.
10 meter tuner—28,000-29,850 kc.

The low frequency limit of each tuner is obtained when the shunt ca-



Top chassis view of one of the four tuners used in the communications receiver.

capacity across the secondary of the coils is 365 μ fd.

Tuning Procedure—75 Meter Tuner

Plug the power cable into power socket P_2 on the all-wave tuner and rotate the selector switch to the correct position.

Connect a signal generator to ground and the grid of the mixer tube. Tune the signal generator to 455 kc.

Set the "Selectivity Switch" on the i.f. chassis to "sharp" position.

Adjust the tuning slug of the line transformer L_1 for maximum "R" meter indication. If the "R" meter reads above R8 reduce the signal generator output.

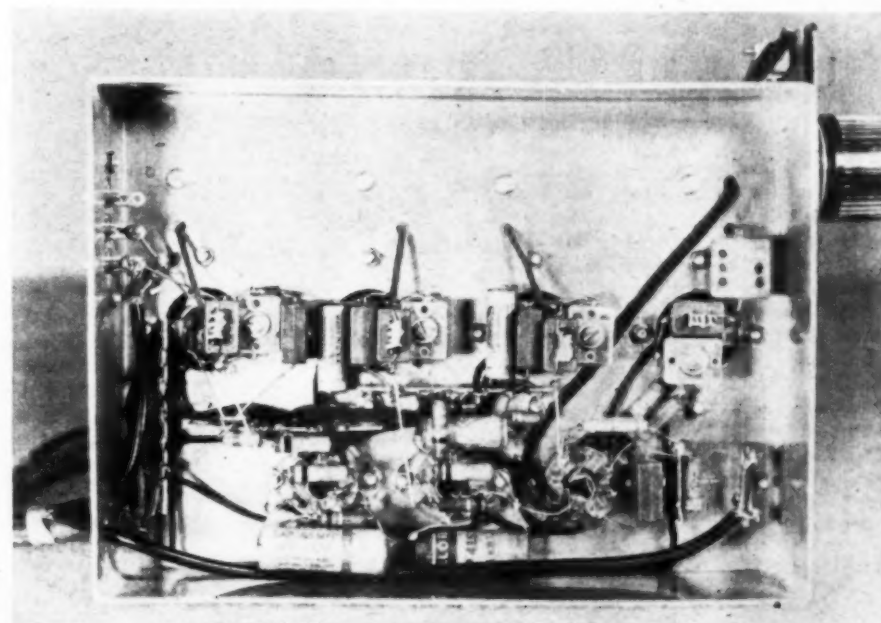
If the "R" meter indicates maxi-

mum with the slug adjustment all the way in, increase capacity C_{20} by shunting it with another 100 μ fd. condenser. If the "R" meter indicates maximum with the slug all the way out reduce the capacity of C_{20} . The tuning adjustment will appear to be broad due to the low impedance of the circuit but the slug adjustment will give a definite indication of resonance when the correct value of capacity C_{20} is determined. If a low tolerance condenser is used this juggling should not be necessary.

Next connect the signal generator to the grid of the second r.f. stage and set the frequency to 4000 kc. Rotate the main tuning condenser to minimum position. Adjust oscillator trim-

(Continued on page 174)

Under chassis view of one of the tuner units. All of the tuners are built on identical standard metal chassis which measure 9 by 6½ by 2 inches in size.



An A.C.-D.C. RECEIVER for AM and FM

By W. A. HARRIS and R. F. DUNN

Tube Dept., Radio Corporation of America

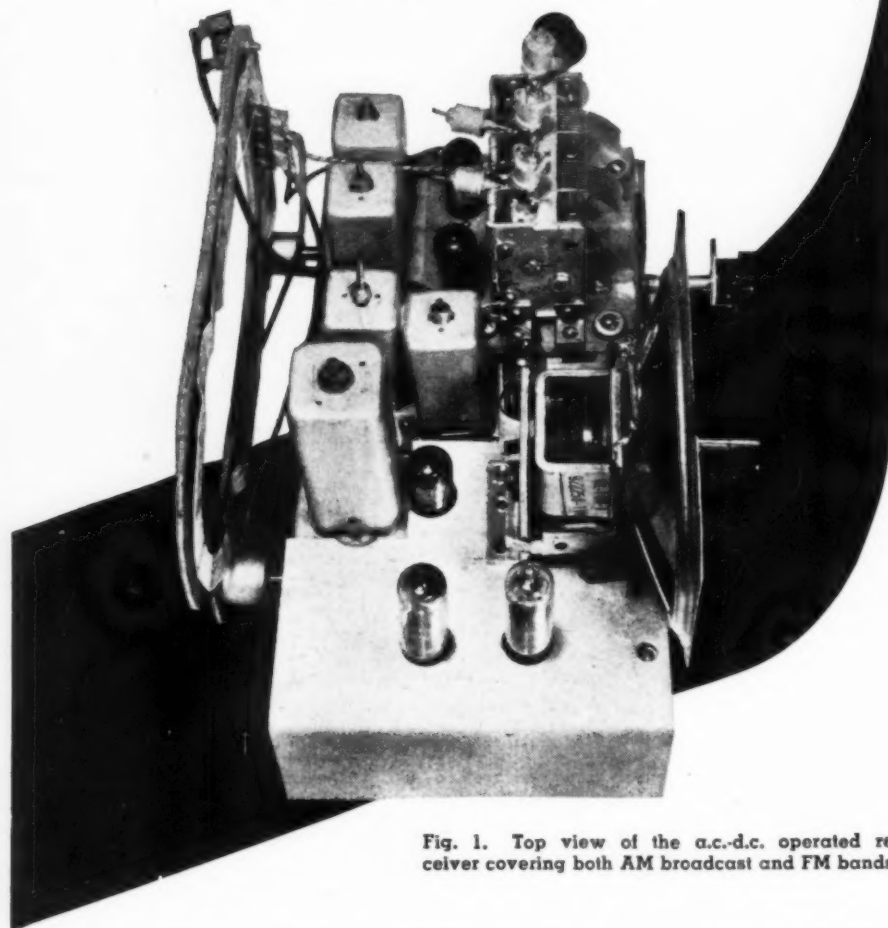


Fig. 1. Top view of the a.c.-d.c. operated receiver covering both AM broadcast and FM bands.

Construction details covering an AM-FM receiver which employs several new-type miniature tubes.

IN THE past, AM receivers for use on either a.c. or d.c. power supplies have enjoyed wide usage. For the future, there are indications that a.c.-d.c. receivers for reception of both AM and FM will have equal popularity. To investigate the possibilities of such a circuit, the authors designed and constructed an a.c.-d.c. AM-FM receiver employing seven tubes and a rectifier. The receiver uses all miniature tubes and covers the high-frequency FM band and the standard broadcast band. It afforded an opportunity to obtain information on the operation of certain new miniature tube types and to check the performance of other miniature types under conditions generally encountered by equipment designers.

The design of a receiver including an FM band does not follow the familiar pattern employed when a short-wave AM band is added to a broadcast receiver. There does not seem to be any practical way to just add FM to an AM receiver. Instead, the problem involves designing an FM receiver and then determining the most practical way to add one or more AM bands. The FM requirements determine the number and types of tubes to be used, the tuning mechanism, and, to a considerable extent, the arrangement of parts.

A list of the tubes used in the receiver described in this article, along with their functions in both the AM and FM bands is given in Table 1. This tube complement fulfills the major

a.c.-d.c. requirement in that the sum of the tube heater voltages is equal to the nominal line voltage. Choice of the 35W4 rectifier permits the use of a six-volt panel lamp connected to the rectifier heater tap and thus provides a saving in power consumption and cost, in comparison with the use of a 117-volt lamp or a lamp operated through a series resistor. Low power consumption is an important feature in a.c.-d.c. receivers, particularly when small cabinets are used.

Type 12AL5, a high-perveance diode identical with type 6AL5 except for heater voltage and current, is used for the FM detector. In FM service, types 6AL5 and 12AL5 are recommended for the ratio-detector type of circuit because of their high perveance and good balance between sections.¹ For the r.f. and i.f. amplifier stages type 6BJ6, a remote cut-off pentode with a six-volt 150-milliampere heater, is used. Although similar to type 6BA6 in many respects, the 6BJ6 has a higher input resistance and a lower input capacitance than the 6BA6. In addition, the difference in basing results in lower feedback admittance for the 6BJ6 at high frequencies. The other tubes listed in Table 1 are well-known miniature types and their functions are identified in the table.

Layout Considerations

The receiver circuit diagram is shown in Fig. 2; a sketch of the chassis layout viewed from the bottom is given in Fig. 4; and a photograph of the receiver, top view, is given in Fig. 1. The r.f. amplifier, converter, gang condenser, and switch are mounted as a sub-assembly. This method of mounting permits the use of rubber gaskets to cushion these components against vibration. When cushioning is used, the sub-assembly is connected to the main cadmium-plated chassis by flexible metal straps. As can be seen from the sketch in Fig. 5, the r.f. sub-assembly is designed to keep all important lead lengths as short as possible. The tuning condenser has five sections, three for FM and two for AM, and is mounted on top of the sub-assembly. The FM coils are rather small, $\frac{3}{16}$ of an inch in diameter and $\frac{1}{4}$ of an inch in length, and are placed just below the tuning condenser. Blocking condensers are used for d.c. isolation on all circuits so that the coils can be connected directly to the sub-assembly at the points where the straps are connected. The r.f. and converter tube sockets are mounted just behind the tuning condenser. A two-section switch is used, with a third stator section added to provide tie points. The broadcast-band oscillator coil and a 455-kilocycle wavetrap are also mounted on the sub-chassis.

The layout of the i.f. stages also is planned so that short grid and plate connections can be used. The transformer location differs from usu-

¹ Seeley, S. W. and Avins, J.: "The Ratio Detector," RCA Review, Vol. VIII, No. 2, p. 201, June, 1947.

al layout practices in that an AM transformer winding is next to the grid of the first i.f. amplifier. This arrangement, dictated by layout considerations and available components, increases the capacitance between grid and cathode of the first i.f. stage in the FM band. Performance, nevertheless, is satisfactory at both intermediate frequencies. The PM speaker is shock mounted. The AM loop antenna is located at the rear of the chassis.

Circuit Design Considerations

A No. 40 panel lamp with a shunt resistor of 150 ohms is used across the heater tap of the 35W4. The rectifier filter circuit consists of two 40 μ fd. condensers and a 560-ohm resistor. For an a.c. line voltage of 117 volts, the rectified d.c. voltage is 118 volts and the filtered voltage is 92 volts. The d.c. output current is 80 milliamperes.

TYPE	AM FUNCTION	FM FUNCTION	HEATER VOLTAGE
6BJ6	R.f. amplifier	R.f. amplifier	6.3
12BE6	Oscillator-mixer	Oscillator-mixer	12.6
6BJ6	I.f. amplifier	I.f. amplifier	6.3
6BJ6	I.f. amplifier	I.f. amplifier (driver)	6.3
12AL5	—	Ratio detector	12.6
6AQ6	Detector, a.f. amplifier	A.f. amplifier	6.3
35B5	Power amplifier	Power amplifier	35.0
35W4	Rectifier, panel lamp supply	Rectifier, panel lamp supply	32.0*
Total Heater Volts			117.4
Heater current			150 ma.

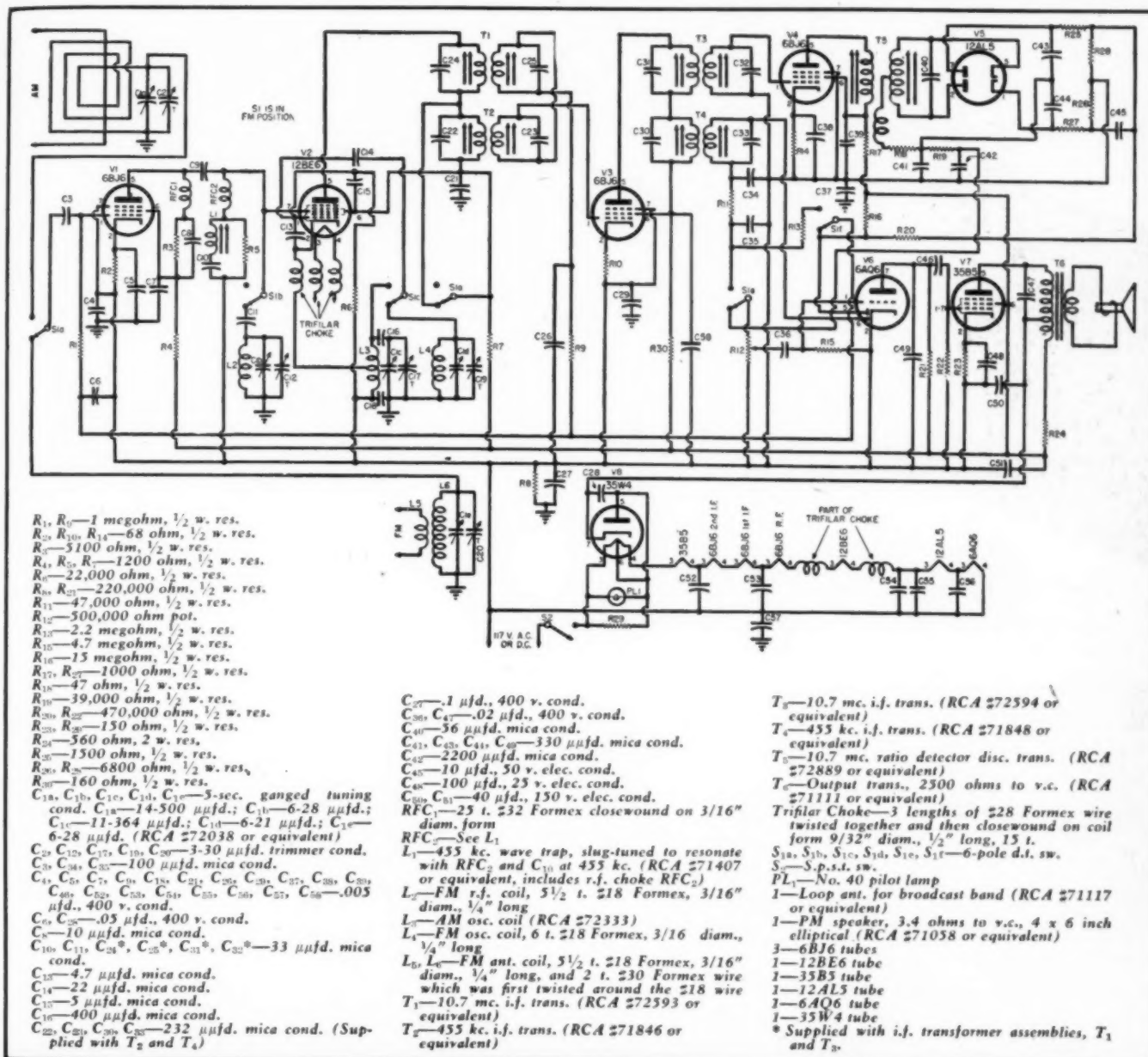
*When a panel lamp is shunted across the 35W4 heater tap, the heater voltage is 32.0 volts. Without the shunt, the heater voltage is 35.0 volts.

Table 1. Tube complement for the a.c.-d.c. operated AM-FM broadcast receiver.

An increase in the power sensitivity of the receiver, is obtained by bypassing the cathode resistor of the 35B5 output tube. The undistorted power output is approximately 0.9 watts and the maximum output is 1.4 watts. The circuit from the grid of the 6AQ6 audio amplifier to the speaker is such as might be employed in a broadcast receiver of conventional design.

The intermediate-frequency for the AM band is 455 kilocycles; for the FM band, it is 10.7 megacycles. The first FM i.f. transformer is overcoupled, the second is undercoupled and a bandwidth of approximately 200 kilocycles at 6 db. is obtained. Although the cathode of the second i.f. amplifier (driver) is bypassed with a condenser, the cathode resistor of the first i.f.

Fig. 2. Circuit diagram and parts list covering an a.c.-d.c. operated AM-FM receiver which covers 530-1620 kc. and 86-111 mc. bands.



BAND	POINT OF INPUT	FREQUENCY*	INPUT VALUE FOR 50 MW. OUTPUT
FM	Second i.f. grid	10.7 mc.	19.0 millivolts
FM	First i.f. grid	10.7 mc.	0.54 millivolts
FM	Converter plate	10.7 mc.	0.075 microamperes
AM	First i.f. grid	455 kc.	3550 microvolts
AM	Converter signal grid	455 kc.	280 microvolts

*Modulated 30% with 400 cycles-per-second.

Table 2. I.f. measurement data covering the home-built AM-FM receiver unit.

BAND	POINT OF INPUT	FREQUENCY*	INPUT VALUE FOR 50 MW. OUTPUT
FM	Converter grid	98 mc.	125 microvolts
FM	R.f. amplifier grid	98 mc.	23 microvolts
FM	Antenna terminals	90 mc.	19 microvolts
	(Over-all receiver sensitivity)	98 mc.	23 microvolts
		105 mc.	23 microvolts
AM	Antenna (input from standard loop)	600 kc.	140 microvolts/meter
		1000 kc.	82 microvolts/meter
		1500 kc.	82 microvolts/meter
AM	Antenna (input to 200 μ fd. dummy antenna in series with antenna terminals)	600 kc.	16.5 microvolts
		1000 kc.	5.5 microvolts
		1500 kc.	3.6 microvolts

*Modulated 30% with 400 cycles-per-second.

Table 3. R.f. measurement data indicates sensitivity of the AM-FM receiver.

amplifier is unbypassed in order to reduce detuning of the grid circuit of the first i.f. stage with change of bias (a.v.c.). In the AM band only the first i.f. amplifier is used. Its bandwidth at 6 db. is 6.0 kilocycles.

Voltage for a.v.c. is applied to the r.f. amplifier and the first i.f. amplifier. For the AM band, this voltage is derived from the 6AQ6 diode detector. For the FM band, a.v.c. voltage is obtained from the ratio detector. Because the voltage-output ratio of d.c. to a.c. is higher for the ratio detector than for the AM diode, a delay circuit is desirable to prevent the application of a.v.c. voltage until the audio voltage is sufficient to pro-

duce maximum output. This delay is obtained by connecting one diode of the 6AQ6 to the a.v.c. for the FM band. Enough current is fed into the diode from the "B+" supply to keep its potential near zero until the a.v.c. voltage at the ratio detector exceeds three volts.

Considerable difficulty was experienced with regeneration in the FM i.f. stages. One of the principal sources of trouble was the audio output side of the ratio detector circuit. In order to reduce feedback, it was necessary to place a metal shield between this circuit and the i.f. stages.

In accordance with preferred a.c.-d.c. practice the a.c. power line is iso-

lated from the chassis and the d.c. circuits are completed through a "B-" lead. The inductive reactance of the "B-" lead is about 1.5 ohms per inch at 10.7 megacycles, so it is not surprising that this lead itself does not constitute an effective ground for the r.f. or i.f. of the FM band. It is necessary, therefore, to bypass the "B-" line to the chassis at several points in order to obtain effective r.f. and i.f. grounding.

The i.f. circuit for the FM band would be the same for an a.c. receiver except for the bypass condensers required between "B-" and chassis. For the particular layout used, the condensers located at the suppressor grid terminals of the 6BJ6 i.f. amplifiers are important in preventing feedback. The locations of some of the other "B-" to-chassis condensers are also critical. The bypass condensers between the heaters and "B-", and those between "B+" and "B-" or the chassis would probably be needed in any a.c. receiver if the same arrangement of components were used. The bypass condensers are disc-shaped ceramic units with a capacitance of approximately 5000 μ fd.; in most instances, their leads are cut very short. The 12AL5 heater bypass condenser and the bypass condenser from "B-" to chassis near the 12AL5 socket are useful in preventing feedback into the receiver input of the 8th, 9th, and 10th harmonic of the intermediate frequency. The number of bypass condensers required between "B-" and chassis is a function of the design and physical layout of the component parts and will, of course, vary for different layouts.

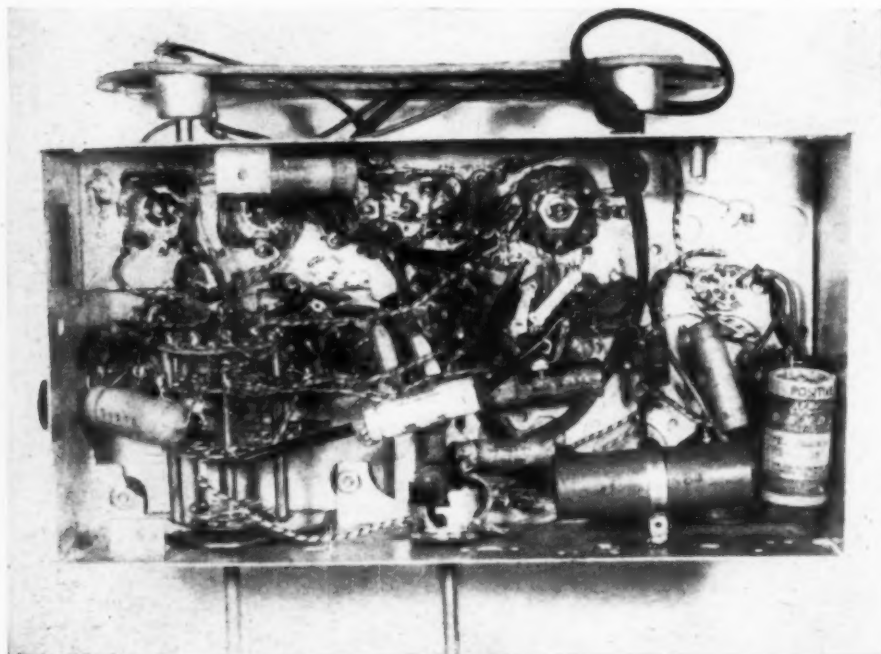
I.F. Stages

The input to each i.f. stage of the receiver for a power output of 50 milliwatts in either band is given in Table 2. At the FM intermediate-frequency of 10.7 megacycles it is difficult to measure the sensitivity of the i.f. system at the 12BE6 converter grid, but an evaluation of the sensitivity of the first FM i.f. stage can be made by measuring the current needed at the converter plate for standard receiver output. This test is made by using a small shielded condenser between the signal generator output terminal and the 12BE6 plate terminal. The condenser constructed for this purpose has a series capacitance of 0.86 μ fd. and a total output capacitance of 2.2 μ fd.; correction for the effect of adding this output capacitance is made by retuning the primary of the first i.f. transformer when the test is made. Because the series reactance of the condenser at 10.7 megacycles is 17,300 ohms, a voltage of 1300 microvolts from the signal generator corresponds to a current of 0.075 microamperes at the 12BE6 plate.

In the absence of feedback, the voltage at the first i.f. grid divided by the current at the converter plate re-

(Continued on page 200)

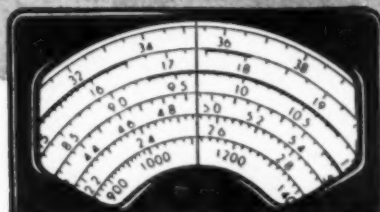
Fig. 3. Under chassis view of the receiver showing component parts layout.





International SHORT-WAVE

Compiled by **KENNETH R. BOORD**



WE ARE pleased this month to dedicate the *ISW Department* to the *British Far Eastern Broadcasting Service*, Singapore, British Malaya. Thanks to Miss Margaret Ballingall, program executive of the station's staff, and to Paul Kary, Pennsylvania, for this information:

BFEBS grew out of a wartime radio station which was set up in New Delhi, India, by the British Ministry of Information's Far Eastern Bureau. This was a propaganda station, broadcasting to enemy-occupied countries in Asia. It shared the studios of All India Radio. When the war with Japan ended in August 1945, the Far Eastern Bureau was partly dissolved and was partly merged with the Foreign Office's Far East Publicity Division (FEP) which was then working in Kandy, Ceylon, at the Supreme Commander's Headquarters (HQ South East Asia Command).

During October-December 1945, HQ SACSEA moved to Singapore, and with it went the FEP Division. A small radio staff came from Colombo, Ceylon, and from New Delhi. Early in December broadcasting on a small scale was started by FEP, using the Cathay Building studios in Singapore and transmitters of the British Military Administration (Malaya). Incidentally, BMA is now *Radio Malaya*. Identification of *BFEBS* became "This is the Far Eastern Service of South East Asia Command calling in the 31- and 41-metre bands." Programs lasted only one and three-quarters hours daily and consisted of broadcasts in *English*, *Dutch*, and *Japanese*. Later in December, *Siamese* and *Indonesian* periods were added, giving the station two and a half hours of transmission daily. BMA frequencies used were 9.548 and 7.220.

In the meantime, two SWB-11 transmitters were being shipped to Singapore from India. They were installed on Singapore Island. Delays were numerous, due to breakages in transit, non-arrival of replacements, and a strike of the employees of the local power company. But by January 19, 1946, power had been applied to one transmitter for testing, and erection of the antenna system had been completed. On February 4, the first transmitter began regular operation on 11.735, and the second went on the air on February 25 on 6.770. Two more

transmitters were "allegedly" on the way.

From January 30 the station had been broadcasting from its own studios on Thomson Road, and a distinct improvement in technical quality was noticeable. An extended program—of four hours' duration—came into operation on February 25, transmitted on 6.770 and 11.735.

Programs were intended for non-British countries in South East Asia, Malaya itself being served by BMA, *Radio Malaya*. *BFEBS* concentrated on reliable news bulletins—served by an efficient monitoring unit—and talks on many aspects of Britain and the British way of life. Program staff was small. The British members were mostly BBC-trained, but specialization was impossible for everyone had to do a bit of everything. The pace was feverish, the hours long, and illness repeatedly cut down personnel numbers. On one memorable occasion, an overworked woman announcer "took hysterics" when about to enter the studio to read the news. The Chief Engineer snatched the bulletin from her and read it in a strong Midland accent, and so saved the day! The supply of phonograph records was pitifully small and shipments from Britain took many months to reach Singapore. The station had no satisfactory material from which to write talks and had to adapt articles from

magazines and newspapers, with copyright hanging like an angry cloud in the background. It was difficult to keep up with requirements, and almost impossible to forge ahead. For example, Miss Ballingall cites a staff report dated May 25, 1946, which said: "Mr. S. (program director) will be going into hospital on Monday for a short course of treatments for dysentery. Mr. B. (announcer, program builder, talks writer) was admitted to hospital on Sunday and expects to remain there for 10 days. Miss O. (announcer, program builder, talks writer, and general organizer) collapsed twice on Friday and was unable to go on duty. Mr. W. (announcer) is still in hospital. Miss M. (record librarian) has been on sick leave since May 11."

Mercifully, the Asiatic staff worked away quietly and well—and in April the station welcomed three Indonesians from Java who initiated a specially-simplified program in Indonesian for village listeners. This had a great deal of success, and the English-program writers also tried to keep their material clear and straightforward so as to appeal to listeners to whom English was pretty much a foreign language.

From June 1, programs were announced as "*The Voice of Britain*," and all mention of SEAC was omitted.

(Continued on page 121)

Through the courtesy of O. Lund Johansen, Copenhagen, publisher of the "*World Radio-Handbook*," we present this picture from Radio Addis Ababa in Ethiopia. The announcer at the microphone is Miss Romane Worke Karaheen. Addis Ababa transmits on 9.620.



STOP THAT PEDESTRIAN

By
ALVIN B. KAUFMAN

TOPPING that pedestrian is a must for the small store. The small store by its very nature receives a considerable percentage of its business from "walk in" unpremeditated purchase-minded pedestrians.

Much consideration has been given to this subject, but perhaps not enough in practical rather than the theoretical approach. This article will discuss both phases, with some concrete practical applications shown.

The best way to get a customer into a small store, is to have him see something that appeals to him in the window display, either from the viewpoint of a bargain or that will strike him as being particularly desirable. *The main problem then resolves itself into getting the pedestrian to look at the window display. This article cannot specify a "bargain" or unusually desirable object as this depends upon location and type of merchandise handled. This article can and will explain how to "stop that pedestrian" so that he will look at your window display.*

The first axiom that applies is that a "static" window, irrespective of its dressing, will rarely have the appeal of an "active" window. By "static" we mean a window with no change of light, sound, or motion. A "static" or non-changing object does not register on the mind or eye of anyone engaged in thinking or talking as he or she passes your store. That is why stop lights, aircraft and aircraft marker lights blink; they are thus drawn to the attention of the individual quickly.

As indicated above an "active" window must be used. Where possible, participation of the pedestrian in causing the action is very excellent and will cause more personal interest and inspection of the window display.

The three phases of light, sound, and motion will be discussed separately as each has its good and bad features.

Light is limited in its uses, especially during the daylight hours. Turning the window lights on and off by means of an automatic switch is not good.



When something is "going on" in your windows, pedestrians will stop, look, and often enter your store to shop.

You can start "selling" your customers on the sidewalk in front of your store with cleverly conceived and executed displays.

Having the pedestrian operate the lights by walking in front of the window (by photo or capacity relay) is not much better. In both cases there is nothing in the window display to attract and hold attention. Light, when used in a window, should consist of a trick or novel device intriguing to young and old alike. Two good versions are the trick light bulb which lights without any connecting wires or the horn gap traveling arc. The trick electric light bulb may be done several ways. The first is to remove the base of the lamp and short the wires, replacing the base with glue. If this lamp is placed on a dish and the dish placed on a concealed electro-magnet

(or coil) the induced e.m.f. will cause the lamp to light. This method is needlessly expensive. A simpler and almost as good solution is the following: A 25 watt colored lamp of the round glass type must be used. Here wires are soldered to the base of the lamp and the lamp is placed on a cloth and supported by sand all around the lamp. Then the base from another lamp is glued on to the top of the colored lamp. The colored lamp then looks as if it is resting, base up, on a pile of sand. This is shown in Fig. 1. A blinker should be used with the light.

The horn gap traveling arc is good day or night. It possesses all three pedestrian-stopping features—light, sound, and motion. Two copper rods or pieces of tubing are supported on high voltage standoff insulators, spaced several inches apart. These tubes, standing vertically, are bent in towards each other to within about an inch and then out about four to six inches and then carried some 20 to 24 inches high. Any good neon transformer of about 15,000 volts is connected to the bottom of the horn gap. A neon type transformer must be used, no other type is suitable. With the power on, an arc will start across the narrowest part of the horn gap and will rise to the top of the horn and will go out with a pop. The spacing of the horn gap should be adjusted so

Various pieces of "crowd stopping" equipment that can be operated with capacity relay unit diagrammed in Fig. 3.



Another light version, not too applicable for daytime, is the use of ultraviolet (black light) lamps to cause interesting things to happen when the tungsten lamps are shut off and the ultraviolets go on. This should be done automatically every few minutes. Fans painted with ultraviolet paints, or trick scenery is effective.

Sound has few uses. Music or speech as played over a p.a. system does not attract much attention to the store window. The sound to be effective should apparently emanate from the store window, or in any case be directly connected in some way to the window. One method is sound over a light beam. Using a phonograph to modulate a flashlight bulb or neon bulb, this light is focused onto a photocell and a high gain amplifier which plays the music over a speaker in front of the store. To be effective the light beam must be carried through the plate glass window where the pedestrian can interrupt the light beam, as per printed instructions, and thus stop and start the music. This method is shown in Fig. 3.

too long at a window irrespective of the attraction unless he can participate. A capacity relay may be used to enable our "customer" to participate. The capacity plate (or detection plate)

is camouflaged in the window as shown in the photo taken of the *Ideal Radio & Appliance Store's* display in Los Angeles. The plate says, "Touch Here
(Continued on page 154)

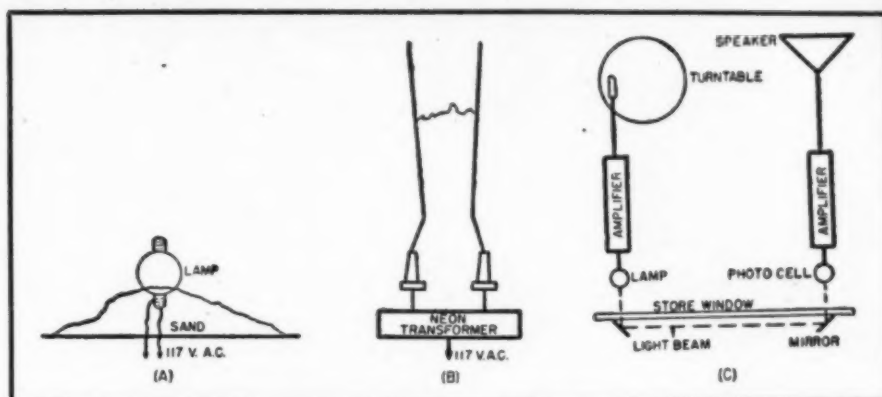


Fig. 1. Three versions of popular "crowd stoppers" discussed in the text.

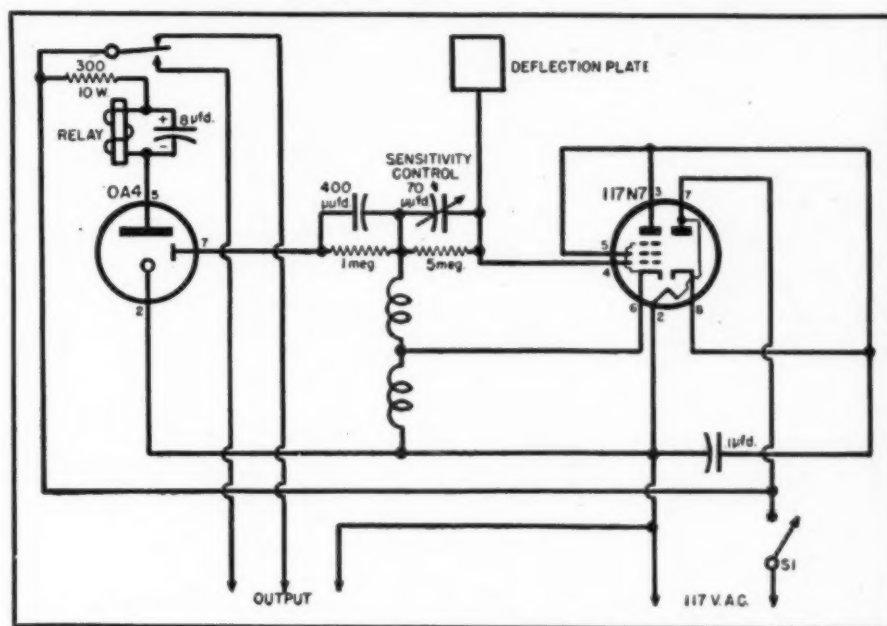
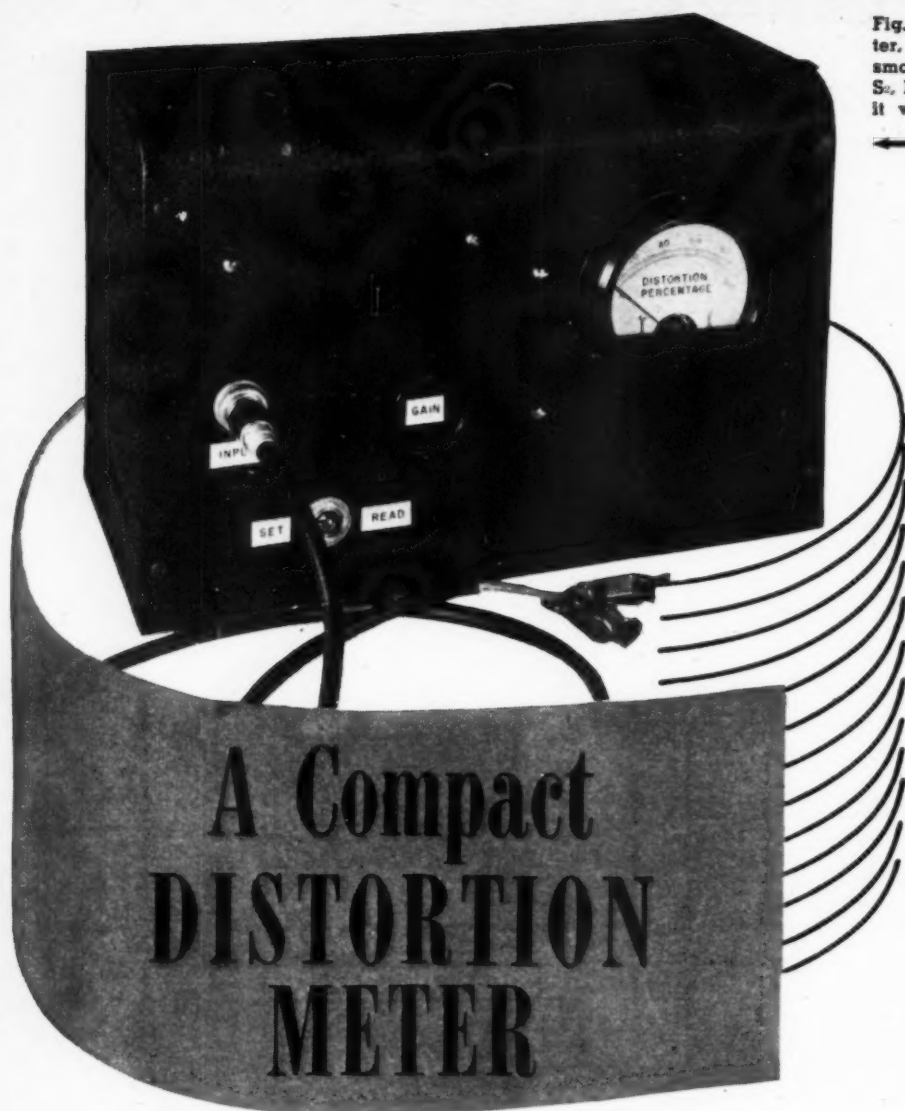


Fig. 2. Circuit diagram of an easily-constructed capacity relay unit.

A capacity operated relay that is always a good attraction for customers. The metal sign helps conceal circuit wires.





A Compact DISTORTION METER

Complete details on an easy-to-build, tubeless, and batteryless test unit. Instrument is direct reading and as simple to use as any voltmeter.

AMPLIFIER servicemen do not question the importance of distortion measurements. But the actual making of these measurements continues to be an untackled job in most shops where audio equipment is checked. While most servicemen are quick to admit that ear estimates of distortion are miserably inadequate, they maintain that oscilloscopic methods of distortion measurement are too complicated and slow and are poorly explained in semi-technical literature.

We have talked with a large number of servicemen on the subject and learn that most of them want to measure distortion and are willing to build a simple, inexpensive meter for the purpose. However, they insist that a suitable distortion meter have the following features: (1) be as simple to operate as a non-electronic volt-ohm-meter; (2) give direct readings of distortion percentage, therefore require

no calculations in its ordinary use; (3) operate without tubes, batteries, or power supply; and (4) require no complicated laboratory equipment for adjustment and calibration.

With these requirements in mind, we undertook the design of a simple distortion meter, the constructional details of which are given in this article. This meter is not a precision laboratory instrument, but its accuracy is comparable to the usual run of home-made radio test meters and it will be found entirely adequate for the busy serviceman. The indicating meter (reading direct in distortion percentage) is actuated by a germanium crystal diode, so no tubes, power supply, nor zero adjustment is required.

Operation of the instrument is based upon a simple principle used in several commercial distortion meters. With the thought in mind that an un-

Fig. 1. The completed home-built distortion meter, ready for use. Note the few controls and small size of the instrument. The range switch, S_2 , Fig. 4, is not shown on this assembly since it was added later as an extra refinement.

By
RUFUS P. TURNER
W1AY

derstanding of how the meter operates will enhance its usefulness to the user, we devote the next few paragraphs to an explanation of the operating principle.

Operating Principle

Fig. 2 shows the functional setup of apparatus for checking audio amplifier distortion. The distortion meter is the portion of the circuit enclosed within dotted lines. A test signal from a low-distortion audio oscillator is fed into the input terminals of the amplifier under test. The distortion meter is connected to the voice coil of the loudspeaker. If the test is to be noiseless, the speaker voice coil may be replaced with an equivalent load resistor.

Operation of the test circuit is explained in the following manner: Amplifier output voltage is applied to the distortion meter circuit. The bridged-T network (comprised of choke coil CH , identical condensers C_1 and C_2 and resistor R) suppresses the fundamental frequency of the amplifier output signal but allows the harmonics to pass with very slight reduction.

The output voltmeter accordingly will be deflected, to all practical intents and purposes, only by the voltage due to the total harmonics present in the amplifier output, and this meter may be graduated in distortion units. The input voltmeter, on the other hand, will read the voltage of the complex audio wave (fundamental and harmonics, depending upon phase relations between the various components). The prime purpose of the input voltmeter is to standardize the input voltage at a certain value upon which the calibration of the output voltmeter depends. The ratio of the voltmeter readings will give the distortion factor with sufficient accuracy for amplifier service applications. If distortion percentage readings are taken directly from a special scale on the output voltmeter, the input voltage must always be set first to an agreed standard value.

All distortion measurements with this type of distortion checking circuit must be made with the test oscillator set to the null frequency of the CH - C_1 - C_2 - R network. Other frequencies may be employed, however, if the bridged-T circuit values are altered properly to provide null points at those frequencies. By proper selection of choke CH , with respect to condensers

C_1 and C_2 , the bridged-T network can be designed for complete removal of the fundamental frequency with negligible effect upon the harmonic frequencies.

From the foregoing explanation, it is seen that this type of distortion-measuring circuit is a distortion totalizer. That is, it indicates the total distortion voltage, rather than evaluating the various harmonics separately. It is this total distortion which is of chief interest to the amplifier serviceman.

Circuit Simplification

The distortion-measuring circuit in Fig. 2 can be simplified by eliminating one of the voltmeters. Input and output voltages then may be read successively on the remaining meter scale by arranging to short-circuit choke CH_1 when reading input voltage. A simple arrangement for accomplishing this result is shown in Fig. 3. The switch, S_1 , is closed to read input voltage and opened to read output voltage (distortion).

A full-wave square-law v. t. voltmeter usually is employed as the indicator in the distortion-measuring circuit. This type of voltmeter has found favor since it gives good accuracy when used on voltages of complex waveform. The full-wave square-law instrument does not discriminate strongly against the harmonics present. The circuit may be simplified still further, however, by employing a germanium crystal diode and d.c. microammeter in place of the v. t. voltmeter (see Fig. 3). While the crystal-microammeter combination forms an average-reading voltmeter which reads only the positive half-cycles, the harmonic error of this type of meter is not prohibitive in service test applications, provided the signal voltage is kept high enough to give linear response. We can get along with reading only positive half-cycles, since in the usual run of amplifier service practice the second harmonic (which, like the other even-numbered harmonics, shows up on the positive half-cycle) usually is the predominant and most troublesome distortion component. Also, the odd-numbered harmonics tend to distort the wave symmetrically; that is, they affect both positive and negative half-cycles in the same way.

Complete Instrument

The finished distortion meter, employing the principles just explained, is shown in Figs. 1 and 5. The circuit schematic is Fig. 4A.

The bridged-T network components (C_1 , C_2 , CH_1 , and R_2) have been selected for 400-cycle operation. Distortion measurements accordingly must be made at that frequency. A single-frequency test will be useful and adequate in most cases. However, the null frequency of the network may be shifted, if the operator desires, simply by changing the capacitances. For example, 1000-cycle operation will be ob-

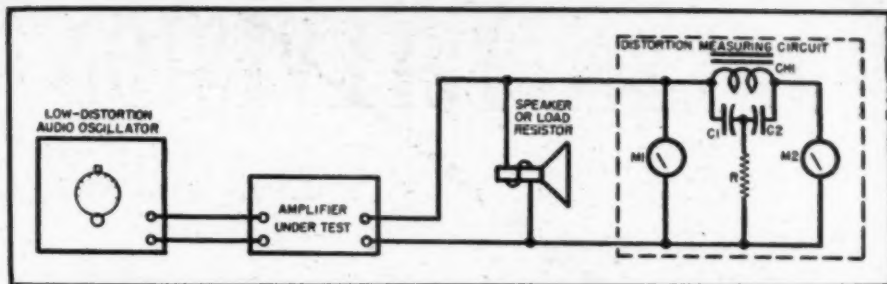


Fig. 2. The equipment setup which is used for distortion checking.

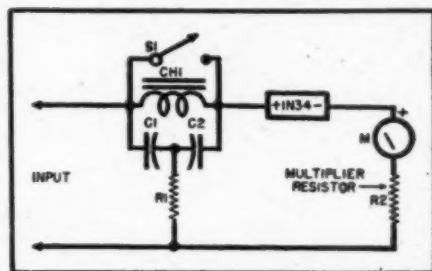


Fig. 3. Single-meter circuit.

tained if C_1 and C_2 are changed to .02 microfarad each. The bridged-T circuit shown in Fig. 4A offers almost no attenuation to the 2nd, 3rd, and 4th harmonics of 400 cycles.

In its "SET" position, switch S_1 short-circuits the network to permit adjustment of the input voltage, by means of gain control R_1 , to the full-scale value of the meter. In the "READ" position of switch S_1 , the network is in the circuit to remove the fundamental frequency.

The audio-frequency voltmeter consists of the 0-100 d.c. microammeter, M , a 1N34 crystal diode, and multiplier resistor R_2 . The specified microammeter has two advantages: It provides a voltmeter with fairly high input resistance, and its 0-to-100 scale may be read directly in percentage dis-

(Continued on page 164)

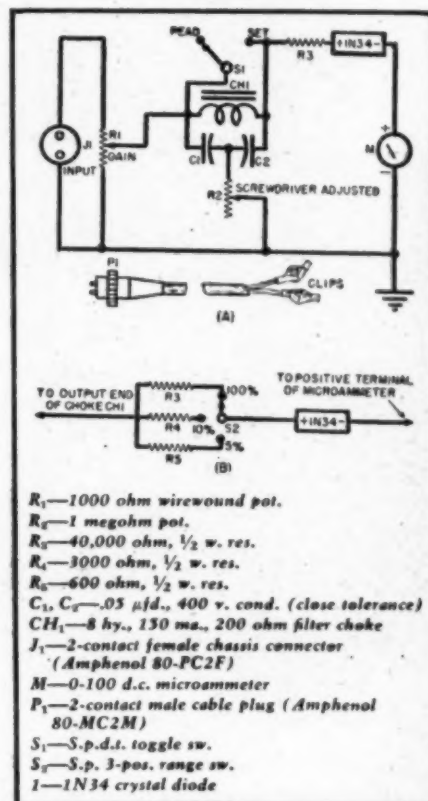


Fig. 4. (A) Circuit diagram of distortion meter. (B) Circuit of meter range switch.

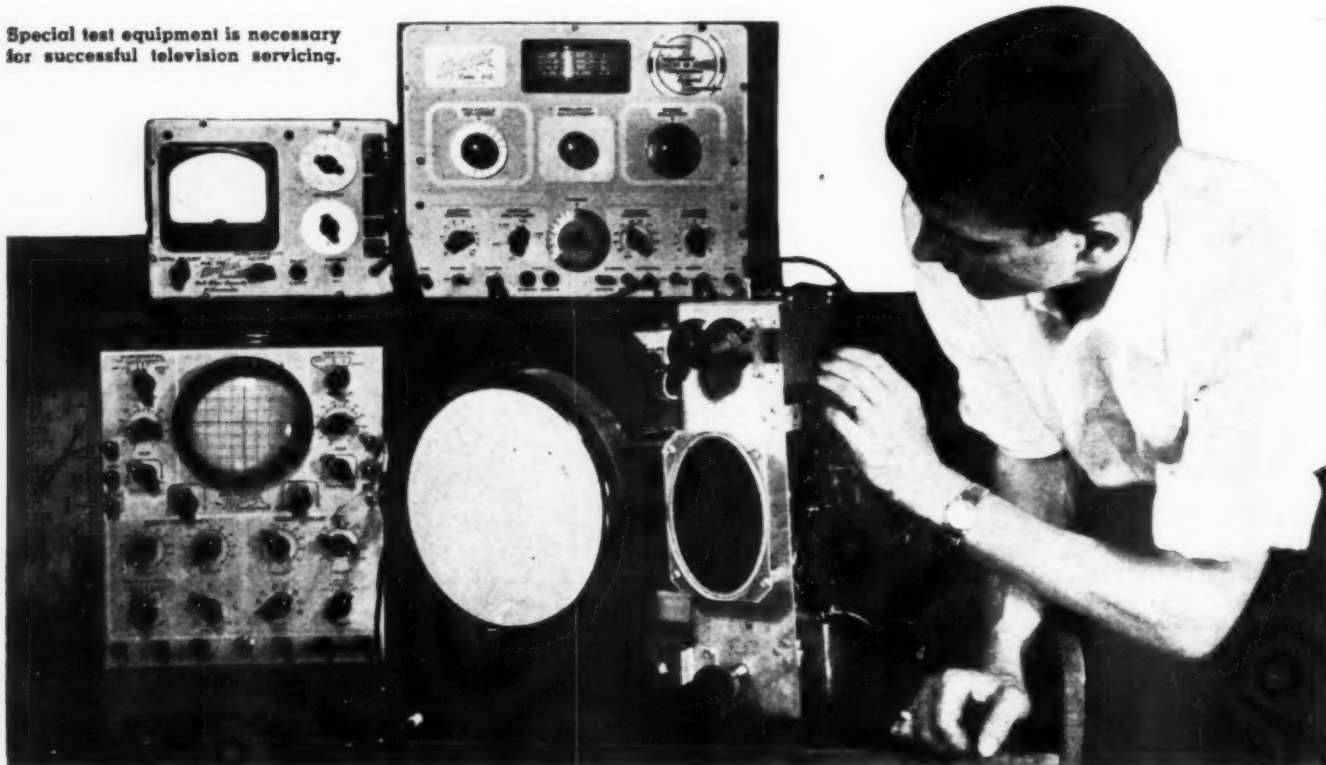
Fig. 5. Inside view of instrument. All components are mounted on back of front panel.



MODERN TELEVISION RECEIVERS

By MILTON S. KIVER

Special test equipment is necessary for successful television servicing.



Part 8. A discussion of the various coupling networks used in TV receivers and video i.f. alignment procedures.

COUPLING networks between stages in the video i.f. system of modern television receivers use either stagger-tuning, transformer windings, or complex arrangements of condensers and coils. In the previous article, we considered the various forms of stagger-tuned and transformer-coupled networks; now let us turn our attention to complex-coupled systems. Into this category fall such receivers as *Philco*, *DuMont*, *Stromberg-Carlson*, and *United States Television*.

In the *Philco* video i.f. system, Fig. 1, all interstage circuits are capacitively coupled. Thus, L_1 leading to the input i.f. amplifier transfers its energy to L_2 through C_1 and C_2 . For alignment, L_1 and L_2 are peaked to different frequencies and then C_2 is adjusted to provide the desired bandwidth. The trick here is to achieve the proper bandwidth without permitting any appreciable dip to appear in the center of the response curve. In this input network, all signals between 28.1 and 22.1 mc. are permitted to reach the amplifier tube, 6AG5. The audio i.f. signal is then transferred to the audio

system from the plate of the input i.f. amplifier. In the second coupling network located between V_1 and V_2 , the accompanying audio i.f. voltage is sharply attenuated by the trap consisting of L_3 , C_3 , C_4 and R_1 . (The reader will recognize this as a Bridged-T network). L_3 , L_4 , and C_3 form the video i.f. coupling network similar to L_1 , L_2 , C_1 , and C_2 . The bandpass of this network is restricted to the 4.0 mc. required by the video i.f. frequencies.

The third coupling network between V_2 and V_3 is similar to the second circuit but the trap frequency is now at the adjacent sound carrier frequency (28.1 mc. in this instance). The final coupling network between V_3 and the video detector is without a trap. Additional trap circuits do exist in this receiver but they are situated beyond the video detector. 26.6 mc. is the video carrier i.f. value.

The gain of the first two amplifiers, V_1 and V_2 , is automatically controlled by an a.g.c. voltage. The contrast control is completely divorced from the a.g.c. system, being located in the cathode leg of the final video-frequency amplifier feeding the cathode-ray

tube. *United States Television* employs a similar circuit in some of their earlier models.

Stromberg-Carlson, in the 10" CRT receivers, uses the interstage coupling system shown in Fig. 2. Between each stage there are two sets of permeability tuned coils, capacitively coupled to each other. There is no direct inductive coupling between the coils. In each case the coils are peaked to provide the desired bandwidth. Five traps remove possible interference from higher and lower adjacent channels in addition to the sound signal of the channel being received. The first three i.f. stages contain both audio and video signals, necessitating a 5.0 mc. response. Due to the presence of the audio signal, the trap circuits in these stages remove only the audio and video carriers of the adjacent lower channel. After the audio has been separated and transferred to its own system, a sound trap (21.6 mc.) is introduced. At the same time a trap for the video carrier of the adjacent higher channel (20.1 mc.) is also placed in the circuit. The 20.1 mc. trap is purposely inserted beyond the audio separation point because it tunes quite close to the audio carrier frequency (21.6 mc.) and it would attenuate the audio signal if placed in

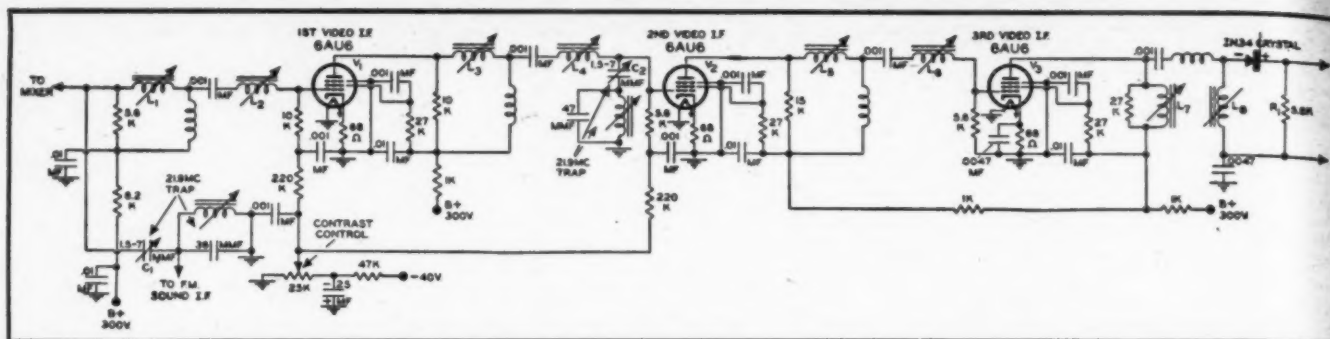


Fig. 4. The video I.F. section of the DuMont Models RA-101 and RA-102 television receivers.

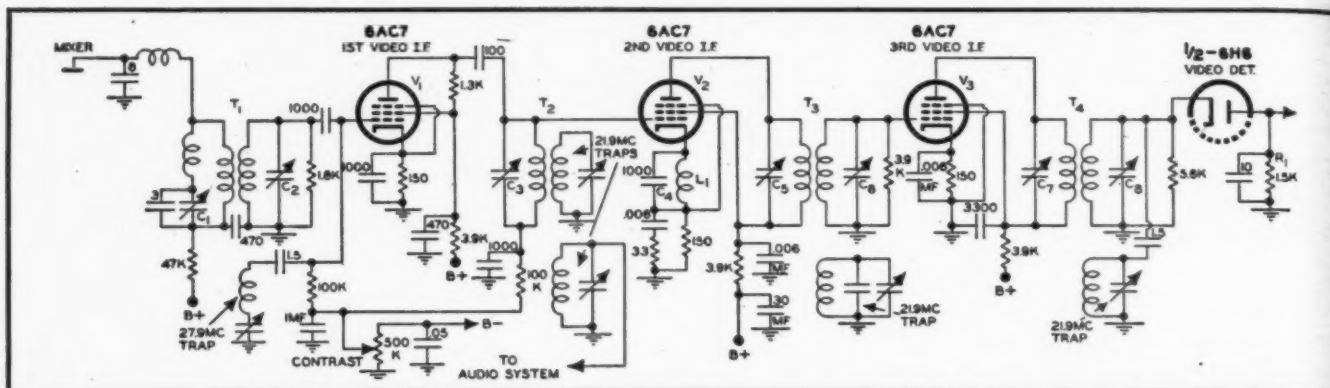


Fig. 5. The video I.f. system employed in General Electric Company's Model 802 video receivers.

a television receiver. As noted previously, the ideal form of the video i.f. response is established by the type of transmission that has been standardized by the FCC and each i.f. system is adjusted until its response is as close as possible to this desired form. Where the manufacturer specifies curves which deviate from the ideal form, the reason can generally be traced to one of the following:

1. A compromise between economy and the most desirable image.
2. The use of a 7 inch (or smaller) C.R.T. Video i.f. bandwidths as low as 2.5 mc. will produce an acceptable picture on screens 7 inches in diameter or less.
3. Compensation at various sections of the response curve in order to offset excessive losses at other points in the signal path. (Thus, peaking the high-frequency end

of the curve is sometimes suggested by the manufacturer in order to offset losses of these frequencies in other circuits of the receiver.)

The equipment required for a complete alignment includes:

1. A sweep signal generator possessing a tuning range from 15 to 30 mc. and a sweep width of at least 6 mc.
2. An AM signal generator; that is, one capable of generating one signal at a time. Desired tuning range—15 to 30 mc.
3. An oscilloscope.
4. A v.t.v.m.

Items 1 and 2 need not necessarily have the limited frequency ranges specified. More probably—and certainly more economically—these ranges would be part of a more extensive coverage incorporating the r.f.

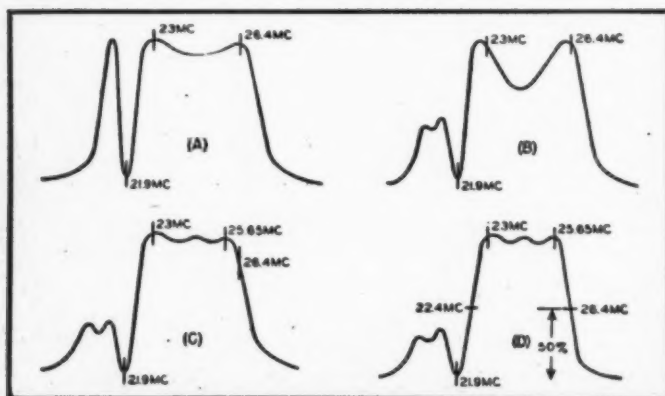
frequencies as well. When the serviceman sets out to purchase test instruments—especially signal generators—he should list all frequencies ordinarily encountered in his service work and then attempt to obtain an instrument capable of covering as many of these frequencies as possible. Not only will this permit the work

bench to remain as uncluttered as possible, but it often reduces the total expenditure. A scope, a sweep generator, and a television set on one bench will leave very little space for any additional equipment.

To the man who has been accustomed to working on AM sets, the necessity for employing an oscilloscope to align and adjust a television set is sometimes open to skepticism. After all, visual alignment is not essential to the adjustment of AM sets. However, there are several important differences between AM sound receivers and television receivers. In the first place, the bandwidth of an AM sound i.f. system does not exceed ± 5 kc. Thus, a simple peaking adjustment of the i.f. coil or transformer will permit as accurate an adjustment as we ordinarily require. In television sets the bandwidth is 4.0 mc. or wider and peaking a coil to cover a bandpass this wide is not practicable. Second, AM sound signals are transmitted with identical upper and lower sidebands. In the receiver, peaking of the coils produces an equal response on either side of this peaking frequency and both sidebands receive equal amplification. In television broadcasting, only the upper sideband is present in its entirety. This requires a non-symmetrical response in the receiver. Again we come back to the basic difference between sound and video i.f. systems, namely, form of the i.f. system response curve. There is no quick and simple method of aurally checking a video i.f. response. You must see the curve to determine whether or not it has the proper form.

(Continued on page 137)

Fig. 6. The response curves of the G.E. video i.f. system shown in Fig. 5. See the text for explanation of curves.



HERE IS MCGEE'S 8-PAGE AD



THE ZENITH OF RADIO PARTS
VALUES—MANY ITEMS AT
LESS THAN JOBBERS COST
THOUSANDS LIKE THESE
LISTED BELOW—

**15 INCH P.M.
SPEAKER**

HOTTEST BUY OF THE YEAR
NEW 1946 PRODUCTION



ESPECIALLY MADE

FOR "JUKE BOXES"

STOCK NO. 15-KB

MADE BY A NATIONALLY KNOWN MFR.

AT THIS SENSATIONAL PRICE

\$10⁹⁵ TWO FOR \$19⁹⁵

**15-INCH PERMANENT MAGNET SPEAKER
SCOOP OF ALL TIMES**

Pre-War or Post-War, you never bought a speaker like this, for such a scoop price. Made by a nationally known builder of fine speakers. A full 15" 12 1/2 oz. Alnico V magnet speaker of juke box quality. Has standard 8 ohm voice coil. Will take up to 15 watts average or 25 watts peak. Here is a speaker that will bring out those low notes. Latest 1946 production; not like through-puts. Every speaker is guaranteed new and perfect. We may not be able to continue this offer for long, so place your order now. Stock No. 15-KB. Weight 11 lbs. A \$25.00 value for only \$19.95.

THE KING JUKE

35 WATT 15 INCH P. M. SPEAKER

WORLD'S FINEST JUMBO SPEAKER VALUE

Model 15-KB, 12", 21 1/2 oz. Alnico V magnet PM speaker. Will take 25 watts with ease. Thousands of dollars were spent in building the fine tools to produce this speaker. The 8 ohm voice coil is 1 1/2" in diameter and has been heat treated and plastic coated. Constructed to eliminate loose voice coils, wires and warping. Made by a renowned builder of fine speakers. Truly the King of juke box speakers. Weight 15 lbs. Net Price \$19.95. 2 for \$38.00.

OUR LOW PRICE ON THE "KING JUKE" \$19⁹⁵ TWO FOR \$38⁰⁰

MAGNAVOX

6 1/2 inch 1800 ohm field Magnavox speaker with 8 ohm output. A fine replacement speaker.

\$1⁹⁵

UTAH

Heavy duty 5 inch Utah 450 ohm field and hum bucking coil. 50L6 output transformer attached.

\$1⁸⁹

PERMAFLUX

5 inch Permaflux speaker with 1 1/2 oz. Alnico V magnet and 50L6 output transformer attached.

\$1⁴⁹

UTAH

5 1/2 inch Utah speaker with 2 1/2 oz. Alnico V magnet and 50L6 output transformer attached. Made for the overseas Zenith. Order a good stock now.

\$1⁹⁵

MCGEE RADIO CO. 1225 MCGEE ST. KANSAS CITY, MO.

THE COAXIAL

• NATIONALLY KNOWN MAKE

THE SPEAKER FOR HIGH FIDELITY

Designed by one of America's finest speaker builders, for FM high fidelity radios, record players and P.A. systems. This speaker is incorporated in radios selling in the \$500.00 bracket. It is especially designed 12" Alnico V magnet PM with built-in 3" Alnico V tweeter. The high-pass filter is concealed under the pot cover. Just hook to any 8 ohm voice coil. (Will hook in place of any house radio speaker, as most speakers have 8 ohm voice coils), only two wires to connect. Will handle approximately 18 watts. This coaxial PM speaker should sell for \$35.00. Why buy an ordinary speaker, when we are offering a co-axial Alnico V PM for only \$12.95? Latest 1948 production. Not surplus. All speakers are guaranteed new and perfect. Stock No. 4-12X. Weight 8 lbs.

DUAL SPEAKER SYSTEM WIDE RANGE RESPONSE

• EASY TO INSTALL

• A PRICE YOU CAN AFFORD

COAXIAL

12-INCH
ALNICO V P.M.
SPEAKER

TWO IN ONE

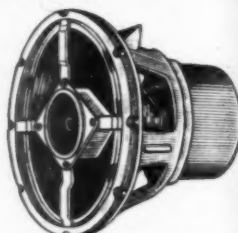
FREQUENCY RESPONSE 50 TO 10,000 CPS

REGULAR \$27.50 LIST

\$12.95
EACH

\$24.95
TWO FOR

50 TO 10,000 C.P.S.



STOCK NO. 4-12X



OUR LEADER
★
12"
COAXIAL
PM SPEAKER

\$9.95 TWO FOR \$19.00

Model 12-RN—Our leader 12" coaxial PM speaker, with 3" tweeter. Equal to above model 4-12X except tweeter will not respond to as high a frequency. Matching network is built-in; hook to any 8 ohm output. Will take 15 watts. Weight 12 lbs. Net \$9.95, 2 for \$19.00.

A 5" P.M. 6 INCH AND LARGER SENSATIONAL PRICES

6" 1.5 oz. Alnico V PM speaker.... \$1.49
6" 2.15 oz. Alnico V PM speaker.... 1.98
4x6" 1.5 oz. Alnico V PM speaker... 1.49
6x9" 3.16 oz. Alnico V PM speaker... 2.98



1948 PRODUCTION
4" and 5" and 6"
P.M. SPEAKERS

Unbeatable Prices

McGee offers the answer to your replacement speaker problems. All fully guaranteed first line run (not odds and ends), with Alnico V magnet and standard RMA 3.2 ohm voice coils. Made by the Perfection Speaker Company. Cadmium plated with dust cover and output transformer bracket. The small size pots make them adaptable to tight fitting places. All sizes have the same size magnet width and depth. 2 1/4" pot size only 1 1/4" by 1 1/4". Packed 24 to the case. These are the choice of our local service crowd.

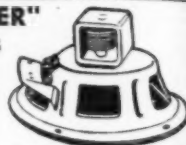
3 1/2" square frame 1 oz. magnet speaker.....	\$0.99
4" square frame 1 oz. magnet speaker.....	.99
4" square frame 1 1/2 oz. magnet speaker.....	1.19
5" round frame 1 oz. magnet speaker.....	.99
5" round frame 1 1/2 oz. magnet speaker.....	1.19
6" square frame 1 oz. magnet speaker.....	1.49
6" square frame 1.47 oz. magnet speaker.....	1.69



"OUR LEADER"
IN 12" P.M.'s

Only **\$4.95**

12" 6.8 Oz. Mag. P.M. Speaker \$4.95



Nationally known 12" 6.8 oz. Alnico V P.M. with 1" 8 ohm voice coil. Will take 15 watts. Grey finish. Our leading 12" speaker. Stock No. CH-12. Net. \$4.95.

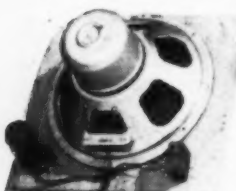
12" 12 Oz. Mag. Will Take 20 Watts \$8.95
Super heavy duty 12" 12 1/2 oz. Alnico V magnet PM with 1 1/4" with 8 ohm voice coil. This speaker is equal to 60 oz. of old type magnet. Will take 25 watt peak. Stock No. CH-13—\$8.95; two for \$17.00.

P.M.'s WITH OUTPUTS ATTACHED

6 1/2" 1.47 oz. Alnico V PM with PP 50L6 output..... \$1.95
5" 1.47 oz. Alnico V PM speaker with 50L6 output..... \$1.49
5 1/2" Utah, 2.15 oz. Alnico V PM speaker with output transformer to match 3Q5 tube..... \$1.95
4"x6" Alnico V PM with 50L6 trans..... \$1.69
4" 1.47 oz. Alnico V PM with 50L6 trans..... \$1.49

THEATRE TYPE TWIN SPEAKER, \$29.95 With "University Lab" Tweeter

PLUS CINAUDAGRAPH 15" P.M.



Our sound laboratory has assembled this fine speaker combination. A super heavy duty 15 inch cinaudagraph Alnico V PM and a University Lab. trumpet type high frequency tweeter. Ready-cut plywood baffle and cut to fit grill cloth. All you do is bolt speakers to the baffle and connect in the 4 mfd. high pass filter. This combination will take 35 watts of audio and reproduce 40 to 10,000 cps. A speaker combination of theatre quality. Stock No. BW-3L. Net \$29.95. If a baffle cabinet is desired, order the L-25 below.

University Lab. high frequency tweeter trumpet with connecting instruction. Same tweeter as used on the above theatre combination. Net..... **\$11.76**



A \$75.00 VALUE LIST
WALNUT 15" BAFFLE, \$19.95
FLOOR MODEL

Heavy Rattle Proof Construction

Walnut floor type speaker baffle. Size 12x22x26 inches. Will accommodate either 12 or 15 inch speakers. Air relief cutouts in corner of grill. Weight 30 lbs. A \$25.00 value for only \$19.95. Stock #L-25. Net \$19.95. Why not order one of these with any of the speakers listed in adjacent copy?

A SPEAKER FOR YOUR EVERY NEED

At a Big Saving

10" 4 oz. Alnico V magnet PM speaker.....	\$3.95
10" 7 oz. Alnico V magnet PM speaker.....	4.45
12" 7 oz. Alnico V magnet PM speaker.....	4.95
For radio set and amplifier use. 12" 15 watt, 8 ohm voice coil Alnico V PM. A scoop for \$4.95, 5 for.....	22.50
4" 450 ohm field speaker.....	1.89
5" 450 ohm field speaker.....	1.89
4" 4 ohm field speaker for auto sets.....	1.89
5" 4 ohm field speaker for auto sets.....	1.89
5" 450 ohm field speaker, with output transformer to match single 50L6 tube.....	1.98
8" 450 ohm field speaker with output transformer to match single 6V6 tube.....	2.25
8" 1000 ohm field speaker.....	2.95
6" square 1000 ohm field speaker, with 7000 ohm output transformer..	1.95
12" RCA 450 ohm field speaker, ideal for console radio replacements...	4.95

P.M. SPEAKERS with FAMOUS ADJUSTABLE CONES

"The Finest Money Will Buy"

The voice coils on these speakers are mounted to an adjustable metal rim, that can be shifted several thousandths of an inch. The cream of the speaker production. Nationally famous maker. More output per watt.

5" 1 1/2 oz. Alnico V magnet PM. \$1.49	6" 3.16 oz. Alnico V magnet PM.. \$2.98
5 1/2" 2.15 oz. Alnico V magnet PM. 1.98	8" 2.15 oz. Alnico V magnet PM.. 2.98
6" 2.15 oz. Alnico V magnet PM. 2.49	8 3/4" 3.16 oz. Alnico V magnet PM.. 3.98
	12" 7 oz. Alnico V magnet PM.. 6.95



MAGNAVOX SPEAKERS

AUTO REPLACEMENTS

A red hot McGee special. Latest 1948 production Magnavox auto radio replacement speakers. Same as used in original equipment. 4 ohm field and standard voice coils. Every speaker is guaranteed. They will take the wallop of any car radio.

6 IN. SQUARE 4 OHM FIELD.....	\$2.49
7 IN. 4 OHM FIELD.....	2.98
8 IN. 4 OHM FIELD.....	2.98
6 x 9 IN. 4 OHM FIELD.....	2.98

KING SIZE MAGNETS

5" 8 oz. Alnico 3 magnet speaker, net....	\$1.79
8" 12 oz. Alnico 3 magnet speaker, net....	2.98
10" 20 oz. Alnico 3 magnet speaker, net....	4.95
12" 20 oz. Alnico 3 magnet speaker, net....	5.95



DOWN
TO EARTH
PRICES

5000 Famous Magnavox permanent magnet Alnico 3 speakers. We are offering these first quality speakers to you, practically at manufacturers prices. These are latest 1948 production. All are guaranteed to be perfect; no rubbing cones.

McGEE RADIO COMPANY

ORDER FROM THIS AD
PRICES F.O.B., K.C.

SEND 25% DEPOSIT—BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI

RADIO & TELEVISION NEWS

RADIO TUBES

250,000 TO SELL. DEALERS
ORDER AT THESE LOW PRICES.
Every tube guaranteed.

100 CARTONED

and GUARANTEED
RADIO TUBES

for only **\$35.00**

Popular GT tubes. All individually cartoned and branded Hy-Vac. Guaranteed best quality. Full replacement. These tubes meet the ever-growing need for low-cost service replacement and counter sales. Over 800,000 sold. A scoop item for the service dealer.

117P7 GT	6A7	3V4	35L6 GT	5Y3 GT
32L7 GT	47	6C5	35Z5 GT	6K6 GT
12A8 GT	12F5 GT	12SA7 GT	50L6 GT	6Q7 GT
12K7 GT	6S8 GT	12SK7 GT	6K7 GT	6V6 GT
25Z6 GT	6P5 GT	12SQ7 GT	6A8 GT	6X5 GT

39c EACH IN SMALLER QUANTITIES

6SA7 GT	117Z3	1L4	12A6	6BA6
6SD7 GT	12AT6	1U4	12SF7	6BE6
6SK7 GT	12BA6	1R5	6F5	6AT6
6SN7 GT	12BE6	1S5	6J5	6X4
6SQ7 GT	35W4	3Q4	6SJ7	6BJ6
25L6 GT	35B5	3S4	12SJ7	6AK5
7017 GT	50B5	1B4	6AJ5	6BH6
117L7 GT	1T4	12K8	6SF5	80

49¢ EACH FOR **75%** OF YOUR
RADIO TUBE NEEDS

BETTER BUY THOSE 12, 50 & 35 VOLT TUBES NOW
BEFORE PRICES RAISE

EVERY TUBE GUARANTEED STANDARD BRAND—CARTONED
AND UNCARTONED

12AH7	6K7	6SL7	12SG7	12SQ7
27	9001	6SN7	12SH7	12SR7
26	9002	6SG7	12SJ7	50L6
78	9003	6SR7	12SA7	12SK7
76	1625	6V6 GT	12SL7	25L6 GT
354	6SA7	6X5 GT	12SC7	35L6 GT
5U4G	6SC7	6AB7	1T4	35Z5 GT
5Y3G	6SF7	12AT6	1R5	35W4
6AC7	6SQ7	12BA6	1S5	50B5
6C5	6SH7	12BE6	6R7	25Z5
6H6	6SJ7	12H6	6L7	25Z6
6J5	6SK7	12J5 GT	7Z4	

50,000
GENUINE

LOCTAL TUBES

49¢ EACH **100 FOR \$45.00**

GUARANTEED—MANUFACTURERS 1ST LINE

35A5	14Q7	7E7	7A7	7Z4
50A5	14B6	7H7	7F7	7Y4
35Y4	14C7	7C7	7N7	1201
14A7	7E5	7B6	7C5	

The above loctal tubes were made by the originator of loctals. 1st grade and guaranteed, full replacement. A purchase of 50,000 enables us to offer these \$2.20 list tubes to you for only 49c each; \$45.00 per hundred.

6L6 METAL TUBES 49c

New metal WAA 6L6 tubes. Good except are rusty due to storage in a damp place. 49c each, 10 for \$4.50.

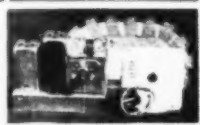
12SG7, WAA metals, good, but rusty, 19c each, 10 for \$1.50.

First line metal 0Z4. This is a hot value at only 69c, 10 for \$6.50.

6L6 metal glass or popular GA, while they last \$1.09, 10 for \$10.00.

SUPERHET BROADCAST

TUNER for connection to phono amp. or P.A. system. Compact chassis 5x3 1/2 x 3 inches. May be mounted inside the record player cabinet. Requires only three connections to amplifier. Uses 6SA7 or 12SA7, 6SK7 or 12SK7 and crystal diode. Complete with tubes, loop antenna, dial and instructions for connecting to any amplifier. Net \$7.95. Specify if tuner is to be used with AC or AC-DC type amplifier.



1948 MODEL—MIKE-BROADCASTER ONLY \$7.95

Broadcasts 800 to 1500 KC from either a phono-graph pick-up or a crystal or dynamic mike. Makes any radio receiver a P.A. system, record player or recording amplifier. Gives broadcast quality. Has fader control from mike to record, simulating a regular broadcast station. This is a powerful model; using 2-35L6, 12SJ7 and 35Z5 tubes. Priced with tubes and connecting instructions. Works on 110 volts AC-DC. Crystal mike and desk stand \$4.95 extra. Model DE-5 truly a de-luxe mike-phono oscillator.



3-TUBE PHONO. OSC. ONLY \$4.95

Model DE-4—Phonograph oscillator. Broadcasts from 800 to 1500 KC. Gain for any crystal pick-up. A new powerful circuit is used to assure plenty of power. Has variable gain control for proper modulation. Priced with tubes ready to operate, two 50L5 and 34W4.

Model DE-4 Net. \$4.95

Manufacturers Type Tubes

HYTRON & TUNG-SOL

PER CARTON

OF

100 TUBES

\$45.00

No Broken Cartons

Guaranteed first line manufacturer tubes Tungsol or Hytron in factory packages, 100 to the carton. These tubes list at \$1.65. Figure the saving at a discount of better than 60-10-10 and 10, actually less than present day manufacturers cost. Sorry, these tubes are sold in cartons of 100 of each type only. If you want less than 100 of one number use list of 49c tubes shown above. Net price on these tubes, 100 for \$45.00.

12SA7, 12SK7, 12SQ7, 35Z5, 35L6, 50L6, 6SA7, 6SK7, 6SQ7, 6V6.

Tungar Bulbs—2 amp for battery charger. Scoop \$1.95
1N34 Crystal Diode with full leads. Scoop price, 99c

GENUINE GENERAL ELECTRIC YGS-3 FM-AM SIGNAL GEN.

**\$195.00 VALUE \$99.50
FOR ONLY**

General Electric Signal Generator Type YGS-3. For FM and AM servicing. An RF oscillator with fundamental frequency range of 100 kc. to 150 mc. An FM oscillator with center frequencies of 1, 20 and 50 mc's, and frequency deviations of plus or minus 20, 300 and 750 kc., respectively. A 1 megacycle crystal calibrator and variable-frequency audio oscillator. These four units may be used independently or in any logical combination by switching the front panel controls. Tube complement: 4-6AK6, 1-6AG5, 1-6SL7, 1-6AF6, 1-6SN7, 1-6J6, 1-9006 and 1-5Y3. Scoop price regular \$195.00 YGS-3 Signal Generator, Net \$99.50.

POPULAR 1 1/2 VOLT LOCTALS

59c each 10 for \$5.50

Guaranteed 1 1/2 volt loctal tubes, regular \$2.65 list, now offered at the ridiculous price of only 59c each, 10 for \$5.50.

1LN5 1LD5 1LH4 1LC6 1LA6 3LE4

Manufacturers Type Octal 1 1/2 V. Tubes 59c ea.

Guaranteed top quality 1 1/2 volt tubes at a big saving.

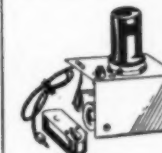
1N5 1H5 1A7 1A5 3Q5



ELECTRIC BLOWER HAIR DRYER

\$5.95

Handy Hannah Blower driven hair dryer. Twin switches and diaphragm control. An indispensable item for every home. Scoop price \$5.95.



G.E. VARIABLE RELUCTANCE PICK-UP AND PRE-AMP \$6.95

Scoop—Pre-amplifier for General Electric Variable Reluctance pick-up. Easily connected to any AC or AC-DC amplifier. Wired and Tested with 68C7 or (128C7) tube. Diagram for connections is furnished. Specify whether you want pre-amplifier for AC or AC-DC use. Net price, Pre-amp. with Tube and G. E. Pick-up—\$6.95.

WHEN ORDERING—Send 25% deposit, with C.O.D. orders. Send full remittance with order less than \$5.00. On parcel post orders, include ample postage. Any extra amount will be refunded.

McGEE RADIO COMPANY

ORDER FROM THIS AD
PRICES F.O.B. K. C.

SEND 25% DEPOSIT—BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI

November, 1948

75

BUILD THIS HIGH FIDELITY RADIO

8-TUBES—12" Coaxial Speaker **\$37.95**

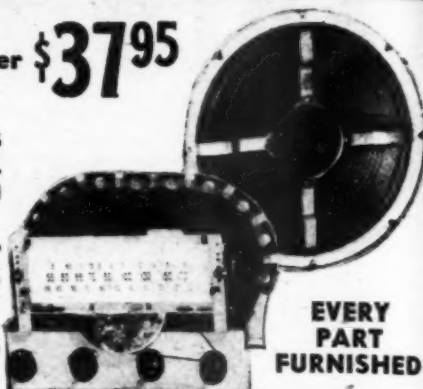
A COMBINED 2-BAND RADIO & 15 WATT P.A. SYSTEM

- 8-INCH SLIDE RULE DIAL
- PUSH PULL OUTPUT TUBES
- EVERY THING FURNISHED
- RECEIVES BROADCAST AND 19 to 49 METERS
- BASS BOOST TONE CONTROL
- CHASSIS SIZE 9 1/2 x 11 x 8" HIGH
- BEST RADIO KIT VALUE IN THE WORLD

Here is something new in radio. A real 15 watt power amplifier with bass and treble controls. Has extra gain stage for crystal or dynamic mikes. And on the same chassis, a standard superhet radio receiver. We furnish all parts, knobs, escutcheon plate and tubes: 6SA7, 6SK7, 6SR7, 6SN7, 6SJ7, two 6V6 and 5Y3. No cabinet. Extra care in designing the power supply section assures low hum level, making this unit ideal for recording as well as P.A. use. We furnish everything as well as schematic diagram and photos of the completed chassis. Weight 35 lbs.

PRK-24 Radio-Amp. Kit with 12" P.M. speaker. With tubesNet **\$29.95**

CPR-15. Exactly the same kit as the PRK-24 kit, except it is furnished with a 12" Cinaudagraph wide range speaker. (Has built-in high frequency tweeter.) This is our finest kit.Net **\$37.95**



EVERY PART FURNISHED

NATIONALLY FAMOUS

GAROD PERSONAL RADIO

Complete with Batteries

Size: 6 1/2" x 3 1/4" x 4 1/8"

Weights Only 3 1/2 Lbs.

- Two-Tone Ivory, Red Plastic Cab.
- 4-Tube Superhet
- Two-Gang Cond., Lucite Dial
- Loop Aerial, Built-In Lid
- AVC.
- Looks like and is a Commercial Radio Kit
- Simple Assembly and Wiring Instructions

This kit is ready for immediate delivery. The same nationally known factory that manufactures tens of thousands of this radio, is line-producing this radio kit for us. Every part, from the cabinet down to the last resistor, is matched. The chassis is ready punched; all you do, is mount the parts and wire. This radio kit will assemble into a beautiful personal radio for you, just the same as it does for the factory. We furnish you a diagram, photograph of the completed chassis and full assembly instructions so that those with a minimum knowledge of radio may wire this kit. The beautiful case is made of metal with plastic hinged lid and snap-on back. The lucite face of the receiver has an inlaid gold design. The circuit is the conventional two-gang superhet type, with A.V.C. Receives the broadcast band, 540 to 1650 KC. Uses miniature tubes: 1R5 converter, 1R5 detector A.V.C., IT4 amplifier and 3S4 power amplifier, Alnico V PM speaker. The loop antenna is built in the lid. Radio comes on automatically when lid opens. Operates on self-contained batteries. Priced complete with tubes and 6 3/4 volt "B" battery and flash cell (Not AC-DC). Nothing else to buy. Model X-45, Price \$14.95. Include Postage for 6 lbs.

SCOOP MODEL X-45 PERSONAL PORTABLE KIT WIRED AND TESTED WITH BATTERIES. NET \$17.95



WALNUT ARM CHAIR CABINET

\$29.95

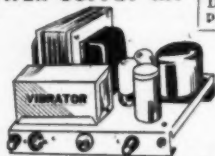
WILL HOUSE CRP-15 KIT

Beautifully made walnut armchair cabinet. Outside dimensions 24" high, 16 1/4" deep and 27" wide. Ample room for radio receiver 14"

long, 9" high, and 10" deep. Will hold a changer up to 14" square. Will accommodate speaker up to 12". Has record album storage compartment. Hinged lid covers changer compartment. Cabinet AR-15. Net price \$29.95. General instrument changer \$14.95, extra. Armchair cabinet in blonde finish. Net price \$34.95.

6-110 VOLT POWER SUPPLY KIT MAKES ANY AMP. WORK ON A STORAGE BATTERY

\$14.95



New Power Supply Kit adapts any amplifier to 6-110 volt operation. Kit includes all parts, tubes, transformer, vibrator, ready-punched chassis and diagrams necessary for you to build this 6 volt DC or 110 volt AC power supply. The average radio man should wire this unit in an hour or less. Supply furnishes from 110 volts 60 cycle, 350 volts DC at 135 mills, 6.3 volts AC. Also, from 6 volts DC it produces 110 volts 60 cycle AC to run a phono motor, record changer, or small AC-DC radio; 350 volts DC at 135 Mills. Instructions are furnished, to show you how this supply can be adapted to make any P.A. systems, up to 25 watts, operates on 6 volts DC or 110 volts AC. Switching is done in the power supply. Everything complete, including 2-6X5 rectifiers. Kit 6-110KR. Net \$14.95. Spare heavy duty vibrator, \$1.95 extra.

6-110 volt amplifier kit. A companion unit to the power supply kit above. Utilizing PP 6L6 output tubes, unit-match transformer, inputs for microphone and phono pick-up. Kit includes 6-110KR unit shown above. Kit model 22-KR. Net price \$29.95.

TOOLS FOR THE BUILDER

Ungar soldering pencil.....	\$1.49
90 watt soldering iron.....	2.49
100 watt soldering iron.....	3.29
1 lb. spool Kester resin solder.....	.99
5 inch Krauter long nose or diagonal cutters, each.....	1.49
Supreme publication radio service course book.....	2.50

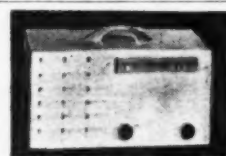
INTER-COM KITS \$7.95

Inter-com kit. All parts furnished to build a small two-way call system (Master and one sub-station speaker). Has 3" speaker and tubes 70L7 and 128L7. Has separate 3" speaker for sub-station. Ready punched chassis. Everything complete, less cabinet. Diagrams and photo furnished. Kit TB-3.



4-TUBE BATTERY PORTABLE KIT \$10.95

Portable Kit Model KP-Y. Housed in a leatherette case 12" x 7" x 7". Easy to build. Operated on self-contained B and A batteries. Receives broadcast 550 to 1600 KC. Incorporates a standard superhet circuit with AVC. Has 5" Alnico V PM speaker. Priced complete with batteries, schematic diagram and tubes 1R5, 1R5, IT4, and 3S4. Not AC-DC, but straight battery operated. Has 2 gang condenser. Everyone should have one of these personal portables. Everything furnished. Kit KP-Y Net price \$10.95.



DELUXE 3-WAY PORTABLE KIT \$16.95

Model 3-ZB, 3-way portable kit. Has 4 tubes plus selenium rectifier. Complete with 300 hour battery pack and beautiful leatherette covered case 12" x 10" x 7". Build this powerful 3-way portable kit. Operates on 110 volts AC or DC or on self-contained battery pack. Receives broadcast 550 to 1600 KC. Incorporates a standard superhet circuit with AVC and loop antenna. Has 5" Alnico V PM speaker, 2 gang condenser. All parts and battery pack are furnished, including tubes. Disc rectifier, 1R5, 1R5, IT4, and 3S4. Shipping weight 14 lbs. Net price kit 3-ZB, \$16.95.

12 WATT AMPLIFIER KIT, \$10.95



Push Pull 6V6's Gain for Mike

KIT MODEL AC-12. 12 watt amplifier kit. Ideal for high quality record player as well as public address or recording amplifier. Matched component parts, ready punched chassis pan. One control fades from phono to microphone. Gain enough for crystal or dynamic microphone. 100 mil power transformer, for 110 volt AC 60 cycle operation. Priced complete with tubes: 2-6V6, 6SN7, 6SH7 and rectifier. Diagrams and photos furnished. Kit AC-12. Net \$10.95. 12" Alnico 5 PM speaker \$6.95 extra; crystal microphone and desk stand \$4.95 extra.

The above AC-12 amplifier wired and tested ready to operate net \$14.95. Specify Stock No. AC-1225. 12-inch Alnico V PM speaker \$5.95 extra. Crystal mike and desk stand \$4.95.

20-WATT UTILITY AMP. KIT, \$17.95

Build this 20 watt utility 110 volt AC, 20 Watt power amplifier. Ready punched chassis, size 12 x 6 x 2 1/2 inches. Has two input circuits, one mike and one phono. Mike stage has 135 DB gain, for crystal or dynamic mike. Has bass and treble controls. Designed for use with PM speakers; has 3-16 ohm output transformer. All parts and easy-to-follow diagram furnished, including tubes: 2-6SN7, 6J5, 2-6L6GA, 5Z3. Kit Model 20-LX.Net \$17.95



POWERFUL SINGLE RECORD PLAYER Z-26

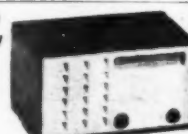
Housed in an attractive leatherette covered cabinet. Latest 78 RPM rim drive motor and light weight pick-up. Ready wired and tested 70L7 type tube amplifier. Tone and volume control, 5" PM speaker (Alnico V). This kit easily slips together. Priced complete with tubes and hook-up instructions. Kit Z-26.Net \$9.95



BUILD A RADIO Like you would buy

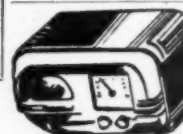
5-TUBE KIT ONLY \$9.95

Made from Detroit Components



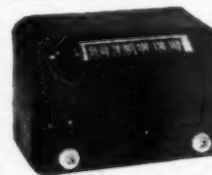
A full size 5 tube superhet radio kit housed in a 13 inch wood cabinet with full plastic front. Lighted slide rule dial. Incorporates a standard 2 gang superhet circuit. Loop antenna, ready punched chassis, etc. This is another one of our fine production radio kits. Every part is furnished including tubes, 14Q7, 14B6, 14A7, 50H5 and 35Y4. Diagrams, photos and instructions are included. 5" dynamic speaker. Receives broadcast 550 to 1650 KC. Weight 9 lbs. Kit model TF-6B. Net \$9.95.

Model TF-6B wired and tested. Net \$12.95.



4 TUBE RADIO KIT \$6.95

4 tube AC-DC TRF radio kit. Ideal for students and beginners. Every part furnished to build this kit, including tubes, diagram and photos. Has Alnico V PM speaker and tubes 12SK7, 12SQ7, 50H5 and 35W4. Plastic cabinet with airplane dial. Receives broadcast 550 to 1600 KC. This is the easiest type of radio to build. Kit Model TF-4 Net \$6.95. Weight 6 lbs.



1949 MODEL AC-DC KIT \$12.95

This is our latest and finest AC-DC radio kit. Receives Broadcast, 540 to 1650 KC. Has full length illuminated slide rule dial. Choice of Ivory or Walnut plastic cabinet. Full high efficiency 3 gang superhet circuit, with loop antenna. Ready punched chassis, full 5" PM speaker. Every part fits. Everything furnished, including tubes, 12SA7, 12SK7, 12SQ7, 35Z5 and 50L6. This kit will go together just like it would on the production line. Diagram, photos and instructions are furnished. Shipping weight 9 lbs. Kit model XA-49. Net \$12.95.

AMERICAN AND FOREIGN KIT \$14.95

550 to 1600 KC and 6 to 18 MC



This radio kit is housed in an attractive grey opalescent finished metal cabinet. Incorporates a standard 2 gang superhet circuit. Receives Broadcast (550 to 1600 KC) and foreign short wave (6 to 18 Megacycles). This kit is complete, nothing else to buy; just as all our kits. Ready-punched chassis. It will go together just as it would down a production line. Has full 5" PM speaker. Complete with tubes: 12SA7, 12SK7, 12SQ7, 35Z5, 50L6. Diagram, photos and instructions are furnished. Shipping weight 10 lbs. Kit model DT-5. Net \$14.95.

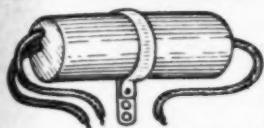
McGEE RADIO COMPANY

ORDER FROM THIS AD PRICES F.O.B. K.C.

SEND 25% DEPOSIT—BALANCE C. O. D. 1225 McGEE ST., KANSAS CITY, MISSOURI

BIG SALE! ONE MILLION "FAMOUS BRAND" CONDENSERS

SAVE UP TO 75%—ALL FRESH STOCK—ALL GUARANTEED ONE YEAR

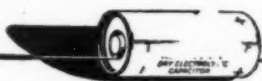


Tubular Replacement Elec. Manufacturer's Type

We sell these every day by the hundreds. A small physical size, guaranteed for one year.

Cardboard banks, paper tubulars, manufacturer's type.	
20-20 150v cond.....	\$0.29
20-20 150v cond.....	\$0.35
20-20 150v cond.....	\$0.39
40-40 150v cond.....	\$0.39
50-50 150v cond.....	\$0.39
50-30-20 150v cond.....	\$0.49
50-30 150v. 25 25v cond.....	.49
10-10-10 400v cond.....	.49

Single Tubular Electrolytics in Metal Sealed Tubes



One year guaranteed. 1st line manufacturer. Aluminum tubes, with insulating sleeve. Lowest prices.

25 mfd 25v.....	\$0.19	8 mfd 450v.....	\$0.29
20 mfd 150v.....	.29	16 mfd 450v.....	.39
40 mfd 150v.....	.39	30 mfd 450v.....	.49



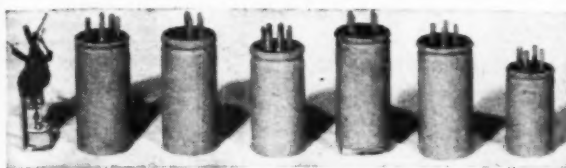
FABRICATED PLATE ELECTROLYTICS

Popular Twist Mounting

These popular F.P. Aluminum can electrolytics are the twist type mounting. Cans are small size 1" x 2" and 1" x 3" and 1 1/4" x 2 1/4". Made by Solar etc. Guaranteed first line, fresh manufacturer's type. More capacity in a smaller space, with these.

10 mfd. 450v FP condenser.....	\$0.29
20 mfd. 450v FP condenser.....	.39
40 mfd. 450v FP condenser.....	.49
10-10 mfd 450v FP condenser.....	.49
10-10-10 mfd 450v FP cond.....	.49
30-15-30 450v. 25-25v FP cond.....	.69
30-30 350v. 25-25v FP cond.....	.39
25-25 25v FP condenser.....	.19
40-20 150v FP condenser.....	.39
40-20 150v 100-25v FP cond.....	.49
40-40 150v. 40-40 25v FP cond.....	.49
50-30 150v 20-50v. 100-10v FP.....	.59

ALL-FRESH ONE YEAR GUARANTEE

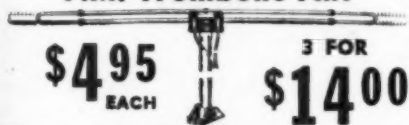


EVERYDAY NEEDS IN 6 VOLT VIBRATORS

Every Vibrator Guaranteed—Best Vibrator Values in U. S.

Replacement sync vibrator unit.....	\$0.99
Standard 5 prong sync vibrator.....	1.49
6 prong reversible sync vibrator.....	1.99
7 prong reversible sync vibrator.....	1.99
7 prong, 2 volt G.E. vibrator.....	1.99
4 prong, off-set Delco vibrator.....	1.49
5 prong sync vibrator.....	1.49
4 prong vibrator for Ford.....	1.49

STROMBERG-CARLSON F.M. Trombone Ant



Super value. Folded Di-pole antenna, for FM and Television. Complete with 60 feet of twin 300 ohm line and 4 low-loss stand-off insulators. This folded di-pole covers frequencies 42 through 105 megacycles. Trombone action makes exact tuning to any one weak station. Furnished with adjustable mounting bracket. Has 5 foot mast. Made for Stromberg-Carlson. Stock No. Mt-800—Net \$4.95. Weight 4 lbs. Individually packed.



SHURE MIKE \$5.95

Shure crystal desk mike and stand. Head is detachable and will fit standard floor stand. A \$10.00 value for only \$5.95. Stock No. SS-T. Net Price\$5.95



AMERICAN D4-T MIKE \$10.95 SCOOP

1st line high impedance dynamic mike. A \$15.00 value, furnished with 20' mike cable. Net Price\$9.95



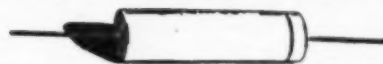
CRYSTAL HAND MIKE \$2.98

Turner crystal hand mike, with 10' mike cable. No provision for mounting. Ideal to have in the shop as a test crystal mike.

SOLAR

C. D. AEROVOX AND SPRAGUE ALL 600-VOLT STANDARD BRANDS

AT LESS THAN JOBBER COST



All these tubular condensers are first run and of nationally known manufacture. Branded and rated 600 working volts. These prices are down to earth. Better order a hundred assorted. You can't go wrong.

BUY 100 ASSORTED FOR \$6.95

.001.....	\$0.06	.02.....	\$0.06
.002.....	.06	.05.....	.07
.005.....	.06	.1.....	.08
.01.....	.06		

Buffer condensers 1600 volts .001, .005, .008, .01, .03 17c each, 10 for.....\$1.50

EQUIPMENT TYPE BYPASSES

Popular sizes of famous brand equipment type 400 volt rated tubular condensers. C.D., Solar or equal. Ideal for replacements in AC-DC sets, etc. We sell these to our dealers by the hundred for \$5.00.

.01 400 volt, .05 400 volt, .1 400 volt 6c each; 100 for \$5.00; .25 400 volt 10c; .5 400 volt 12c

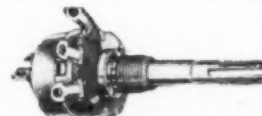
Small diameter vinlon cover mike cable. Sale price 4c per foot. Belden heavy duty mike cable. Best ever made 6c per foot, 100 ft. for \$4.95. Turner crystal.



SOLAR WET ELECTROLYTICS

Genuine Solar Screw Mounting Wet Electrolytics. Latest 1948 production. Use Solar wets when you want a filter for those tough jobs.

8 mfd. 500 volt Wet.....	\$0.78
16 mfd. 500 volt Wet.....	1.15
20 mfd. 500 volt Wet.....	1.23
8 mfd. 600 volt Wet.....	1.23
16 mfd. 600 volt Wet.....	1.64



VOLUME CONTROLS Unbeatable Values

If you are now paying \$1.08 for a volume control with switch, look these values over. Our stock is obtained direct from the manufacturer. Every control guaranteed. No need to pay more than our price for good controls.

Regular manufacturers type with 2 1/4" shaft that is split and knurled. These controls fit 90% of all radio sets.

500,000 ohm with SPST switch.....	.39c	10 for \$3.50
500,000 ohm with DPST switch.....	.39c	10 for 3.50
1 megohm midget with SPST switch.....	.39c	10 for 3.50
500,000 ohm less switch.....	.29c	10 for 2.50
1 megohm midget, less switch.....	.29c	10 for 2.50
Regular 3" shaft jobbers stock controls at scoop prices.		
500,000 ohm with DPST switch for battery radio sets and portable.....	.49c ea.	10 for 4.50
1 megohm taper, with SPST switch.....	.49c ea.	10 for 4.50

Newest molded 600 volt condensers. The best there is. High temperature plastic construction; moisture resistant. Made by a renowned builder of condensers whose name you are familiar with. Save over half on these sizes.

SAVE 50% FAMOUS-BRAND 600V. PLASTICS

.001, .002, .005, .01, .02, 10c each; .05, 11c each; .1 mfd 12c each

VIBRATOR SCOOP!



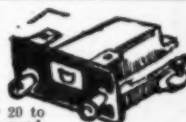
99c Each 10 For \$8.95

Standard size 4 prong vibrator made for uncle. Brand new. Has 8 contact for those standard or heavy drain car sets. Equal to vibrators of \$4.50 list. Regular size can. This is the hottest value in a 4 prong non-sync vibrator in the U. S. Dealers and servicemen, order a good supply now!

MALLORY 4-PRONG \$1.29

Genuine 4 prong, 6 volt Mallory vibrator. 8 point, non-sync. A scoop at only \$1.29 each, 10 for \$11.90.

UNIVERSAL UNDER DASH CONTROLS \$3.98



Attractive Under Dash Remote Control with choice of drive ratios. 8, 10, 12, 16, or 20 to 1. To find the ratio that you need, count the turns from min. to max. of the condenser gang and double. Specify ratio when ordering. If on-off switch in remote control, add \$1.00 to the price.



Heavy Duty Vibrator—Made for 6-110 volt amplifiers. Freq. 40 CPS. Scoop price.....\$1.99 135 ma 6-110 volt conventional power transformer, with all windings; will run phono motor. \$5.95 (Use with above vibrator)

SHURE MIKE \$10.95

Shure CX-50 Crystal mike, with 20' of cable. A full size mike worth 50% more than our price. Net Price\$10.95



McGEE RADIO COMPANY

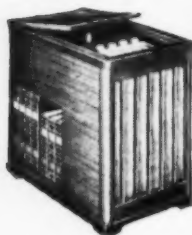
November, 1948

ORDER FROM THIS AD PRICES F.O.B. K. C.

SEND 25% DEPOSIT — BALANCE C. O. D. 1225 McGEE ST., KANSAS CITY, MISSOURI

77

IT'S **McGEE'S** FOR **RADIO SETS** **AM-FM-SHORT WAVE** Custom Chassis



LESS THAN DEALER COST ON THIS WELL KNOWN GAROD ARMCHAIR RADIO-PHONO COMBINATION

NET \$89.50

6 Tube Chairside, 2 band automatic radio phonograph combination. Changer plays 10 12" or 12 10" records. Transformer type AC chassis receives broadcast 540 to 1650 kc and shortwave 5.7 to 18.5 mc. Hand rubbed mahogany piano finish. Cabinet has

record storage compartment 24" x 16" x 27". Scoop price Garod Model 6DCP2 \$89.50. Only a few to sell.



GAROD AM-FM—\$129.50

Beautiful Blond Cabinet

The Garod 11FMP-9 is for those who demand the best in AM-FM reception and automatic record playing. Housed in a beautiful blond cabinet, highly polished and second to none in quality. Size 34x27x16". Has record compartment, two post automatic changer in a slide away drawer on the left. Has 11 tubes and twin speakers. Receives broadcast 540 to 1650kc, shortwave 5.3 to 18.5 mc and 88 to 108 mc FM. This radio is made to sell for \$259.00. Only 25 to sell. Here is your chance to get a radio as beautiful and as fine as was ever built. Better order yours today. Net price **\$129.50**.

STATUE-RADIO \$26.95

Bronze Horse With 5-Tube Radio in Base

Globe Model 559 Statue-Radio. An artistic achievement in design. An authentic reproduction of a horse, in gleaming bronze. Mounted on a dark mahogany base containing the powerful AC-DC superhet radio Tunes broadcast 540 to 1620kc. Full 5 tubes, with Alnico V PM speaker. Height 13 1/2 inches. Net Price **\$26.95**. 3 for \$24.95.



COIN OPERATED RADIO SETS—ONLY \$24.95 EACH

RCA
Licensed.

Model No. MI-131174. Coin Operated Radio. The Sensation of the year. 6 tube, 2 band, American and Foreign shortwave. Gray metal case, trimmed with chrome. Made by America's largest manufacturers. Finance through your local bank and put in Hotels and Tourist Cabins, in your community. You can buy this fine radio unit for about one-half the price the largest operators in the nation have paid for them, the last two years. Has 25c slot, set to play for two hours. This radio has out-sold all other coin operated sets. Even this fine AC chassis is worth more than our price for the whole radio. It is especially made to be easy to service. Don't miss on this. You can have your own business, with 100 of these radios located near your home and they will bring you profit for years to come. Remember, they won't last long at this price. Net Price in single lots, **\$24.95**, 5 for \$110.00. Write for 100 lot price.



OPERATES TWO HOURS FOR 25c AMERICAN & FOREIGN BANDS BRAND NEW 6 TUBES A \$60.00 VALUE

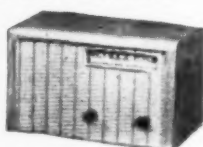
3-WAY PORTABLE \$16.95



Dynavox. A small personal 3-way portable radio. A full superhet circuit 4 tubes plus rectifier. Housed in an attractive leatherette case. Has hinged lid. An exceptional value at only **\$16.95**. Requires 67 1/2 B and flash lite cells for A.

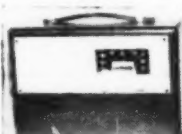
DETROLA 5-TUBE AC-DC \$12.95

Detrola Model 571. Attractive Blond Wood Cabinet AC-DC radio, with plastic grill front. Size 12x7 1/2x8". Covers broadcast band, 540 to 1600kc. Has 5" dynamic speaker. Uses tubes 12SA7, 12SK7, 12SQ7, 50L6 and 3Z5. Loop antenna. Brand new in factory cartons.



OUR LEADER Full Size 3-Way PORTABLE RADIO \$19.95

Full size 3-way portable radio. Operates on self contained 300 hour bat. or 110 volt AC-DC. Has 4 tubes plus disc, rectifier. A full superhet circuit. Attractive tan leatherette case. Made to sell for **\$39.95** our price only \$22.95, weight 10 lb. Made by Nationally known mfg. 7 1/2x9, 96 back bat. \$2.95.



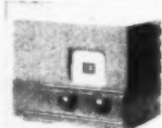
Peewee 3-Way Personal Air King \$19.95

Air King 3-way portable radio. Model A-520. Polystyrene cabinet in maroon with contrasting grill, recessed easy-to-read dials. Superhet, 4 tubes plus selenium rectifier, built in loop antenna. Weighs only 4 lbs. with batteries. Size 8 1/2x5 1/4". Model A-520. Net Price **\$19.95**. Kit of batteries \$1.55, extra.

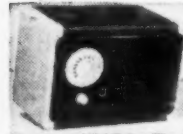


FM-TUNER

Top quality FM tuner for 88 to 108 MC. This is a radio detector type. A full superhet, not a regenerative gadget. This one works or your money back Stock No. FR-88. Net Price **\$20.49**



MECK 3-WAY PERSONAL PORTABLE \$19.95

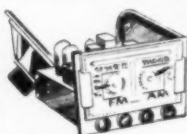


Model 5D-7 Broadcast superhet (550 to 1650 KC) Personal portable; only 5x6x8 inches. A big radio in a small package. Operates on 110 volt AC-DC or self-contained batteries. Has 4 miniature tubes and disc rectifier. Uses 2 45 volt 455 Eveready B batteries and 5

flashlight cells. Net **\$21.95** In lots of 3 **\$19.95** Kit of batteries \$2.69—Extra weight 10 lbs.

MONTHLY SPECIAL GAROD 9-TUBE AM-FM CHASSIS

WITH 12" SPEAKER \$59.95



McGee's monthly special. Garod 9 tube broadcast and FM chassis. Powerful transformer type. Twin lifted plastic dial. Full 12 in. dynamic speaker. This is not a cheaply built chassis but a full grown radio. The same chassis is incorporated in receivers selling for \$300.00. Why not install this in your old cabinet.

This gives added audio power for those who desire push-pull amplification. A 5" speaker is furnished along with the 12" for extended H. F. response. If you want a 15" Cineludograph PM speaker, in place of the 12" speaker, add \$10.00 to the cost; making a total of **\$69.95**.

RCA 6-TUBE 2-Band Radio Chassis \$16.95 5 for \$79.50



Attention foreign buyers. Here is a hot chassis value. Genuine RCA 6 tube AC-DC chassis. Receives broadcast and 19 to 49 meters, shortwave. Has built in loop with 6" slide rule dial 5" speaker. Priced complete with tubes, 12SQ7, 12SA7, 12SK7, 6SQ7, 50L6, and 3Z5. Brand new in factory cartons. Stock No. RCA 6. Shipping weight 14 lbs. Net price **\$16.95** each. 5 for **\$79.50**.

OUR LEADER PORTABLE RADIO RECORDER \$89.50



Our leader AC radio and Dual speed recorder. Another leading value in the electronic field. We bought them right and are passing on our buying power to you. This unit has a standard AC power transformer type, broadcast receiver and recording amplifier. Has General Industries dual speed recorder and playback mechanism, and microphone. A red hot value. Model VT-11. Net **\$89.50**.

Square and Round Chassis Hole Cutters

Round sizes 1/2, 3/4, 1, 1 1/4, 1 1/2, 1 3/4, 2, 2 1/4, 2 1/2, 3, 3 1/4, 4, 4 1/4, 5, 5 1/4, 6, 6 1/4, 7, 7 1/4, 8, 8 1/4, 9, 9 1/4, 10, 10 1/4, 11, 11 1/4, 12, 12 1/4, 13, 13 1/4, 14, 14 1/4, 15, 15 1/4, 16, 16 1/4, 17, 17 1/4, 18, 18 1/4, 19, 19 1/4, 20, 20 1/4, 21, 21 1/4, 22, 22 1/4, 23, 23 1/4, 24, 24 1/4, 25, 25 1/4, 26, 26 1/4, 27, 27 1/4, 28, 28 1/4, 29, 29 1/4, 30, 30 1/4, 31, 31 1/4, 32, 32 1/4, 33, 33 1/4, 34, 34 1/4, 35, 35 1/4, 36, 36 1/4, 37, 37 1/4, 38, 38 1/4, 39, 39 1/4, 40, 40 1/4, 41, 41 1/4, 42, 42 1/4, 43, 43 1/4, 44, 44 1/4, 45, 45 1/4, 46, 46 1/4, 47, 47 1/4, 48, 48 1/4, 49, 49 1/4, 50, 50 1/4, 51, 51 1/4, 52, 52 1/4, 53, 53 1/4, 54, 54 1/4, 55, 55 1/4, 56, 56 1/4, 57, 57 1/4, 58, 58 1/4, 59, 59 1/4, 60, 60 1/4, 61, 61 1/4, 62, 62 1/4, 63, 63 1/4, 64, 64 1/4, 65, 65 1/4, 66, 66 1/4, 67, 67 1/4, 68, 68 1/4, 69, 69 1/4, 70, 70 1/4, 71, 71 1/4, 72, 72 1/4, 73, 73 1/4, 74, 74 1/4, 75, 75 1/4, 76, 76 1/4, 77, 77 1/4, 78, 78 1/4, 79, 79 1/4, 80, 80 1/4, 81, 81 1/4, 82, 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COMPLETE PORTABLE WIRE RECORDER \$69.95

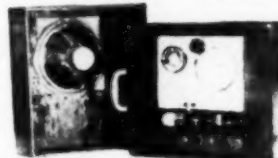
With Webster Chicago Mechanism



Portable Wire Recorder Model GN-11. Has ready wired and tested 5 tube AC type amplifier with push-pull 6V6 tubes. Built-in eraser circuit. Input for crystal mike or phono pickup. Diagrams show how you can record from any radio receiver. 3 position switch enables you to quickly change from record to playback or conventional P. A. system. This amp delivers 12 watts of good clean audio. Here is what you get: Webster 79 recording mechanism, with 15 minute spool of wire, attractive leatherette covered case, 6" heavy duty PM speaker and wired and tested 12 watt AC wire recording amplifier. All you do is mount the amp, recording mechanism and speaker. Simple instructions furnished. Portable Recorder Model GN-11 Net \$69.95. Crystal mike \$4.95 extra.

DELUXE MODEL GN-12 \$79.95

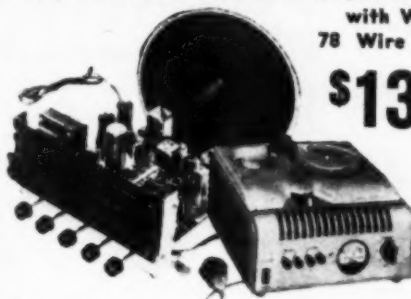
Deluxe Portable Wire Recorder Model GN-12. Has same features as the model GN-11, as well as a larger split leatherette covered case and a heavy duty 10 inch PM speaker. Deluxe Wire Recorder Model GN-12. Net \$79.95. Crystal mike \$4.95 extra. Recording Wire, 15 minute spool \$1.30, 30 minute spool \$1.95, 1 hour spool \$3.25.



CAPITOL 13-TUBE AM/FM RADIO

with Webster
78 Wire Recorder

\$139.50



Capitol 13 tube AM-FM high fidelity chassis. Receives broadcast and FM, 88 to 108 mc. Beautiful slide rule dial. Bass boost tone control. Push-pull 6V6 tubes give high audio fidelity. 12" heavy duty Alnico V PM speaker. And with this chassis a Webster 78 wire recording unit. With these you can make top quality wire recordings from the mike or from any AM or FM radio station. The unique push button arrangement on the wire recorder makes you able to change from radio record to playback quickly. Recordings are played back through the radio's high fidelity audio system. This is without a doubt the most material ever offered for \$139.50. Stock No. CWX-12. Net \$139.50. With 15" Cinaudagraph PM speaker. Net Price \$144.50.

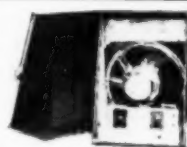
WEBSTER 79 Wire Recording Mechanism \$44.10

WEBSTER 79 WIRE RECORDER, PLAY BACK MECHANISM. Wiring BACK

Diagram of necessary amplifier included with kit. The entire mechanism is a completely assembled unit. Weight 10 pounds. Includes one fifteen minute spool of recording wire. This is the hottest new item in the electronic field. Webster 79 recording mechanism. Net \$44.10. Extra recording wire, fifteen minutes \$1.30; thirty minutes \$1.95; one hour \$3.25.



PORTABLE P.A. \$39.95



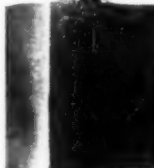
18 watt complete portable public address system. Has inputs for a crystal or dynamic mike and phono pickup. Has push-pull 7C5 tubes in output. Attractive leatherette covered split type case. Priced complete with two 10" PM speakers. This is a complete public address system wired ready to play. Stock No. HC-18. Net \$39.95. Priced complete with crystal mike and desk stand. Amplifier chassis only with tubes, less speaker, case and mike; in kit form. Diagram furnished. Stock No. AC-18 Net \$10.95. AC-15 amplifier wired and tested. Net \$14.95.

8-WATT AMPLIFIER WITH P.P. 50B5 \$9.95

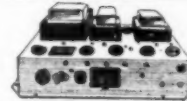
4 tube, plus rectifier, AC-DC amplifier. Push-pull 50B5 output tubes, with 12SJ7 (Gain for mike or G.E. variable reluctance pickup), 12SL7 (Gain for conventional crystal pick-up) and phase inverter. This is a nice small audio amplifier, with tone and fader control, plus inverse feedback. Furnished wired and tested, complete with tubes, 8 watts output. Ready to play. Weight 6 lbs. Model TM-5. Net price \$9.95. Crystal mike and desk stand \$4.95 extra. 8" PM speaker \$2.95 extra. G.E. variable reluctance pick-up cartridge \$4.69 extra.



PAGING AMP. \$16.95



Here is a complete low power P.A. or Paging system, utilizing the TM-5 amplifier described above. Housed in a leatherette covered portable case, with 8" heavy duty speaker. Model N-T5. Net Price \$16.95. Crystal mike and stand \$4.95 extra.



Juke box amplifier surplus. All the necessary parts to build a juke box amplifier. Jumbo power transformer and output. This is a late model with two 6L6 output tubes. All necessary parts and diagram are included. Stock No. KV-7. Net Price \$24.95. with tubes, 12" Alnico V PM speaker \$5.95 extra.

High Fidelity 30 Watt Amp. Kit \$29.95

Kit model RA-30. Complete 30 watt 6L6 power amplifier. Beautiful ready punched chassis, with perforated metal cover. Inputs for 2 mikes and crystal or variable reluctance pickup. All parts are provided, including a husky output transformer and power transformer. All small parts and diagram furnished complete with tubes; 6SJ7, 6XJ7, 6C5, 6C3, 2-6L6, and 5Z3 or equivalent. Nothing else to buy. This kit will make an amplifier you will be proud of. Worth twice our purchase price. Model RA-30, weight 35 lbs. Net Price \$29.95.



MASCO AMP. SALE

35 Watt with Auto Chgr. \$79.50

Masco Amplifier Model MA-35 HC. A powerful 35 watt amplifier (110v AC) with automatic record changer, built on top. Has inputs for two mikes and phono pickup. Unmatch output transformer. Two 6L6 tubes in output. Made to sell to the dealer for \$100.00. A few left. Sale Price \$79.50. complete with tubes. Masco Amplifier Model MA-25P. (110v AC) A 25 watt amplifier, with single phono motor and pickup built-in top. Inputs for two mikes and phono pickup. Two 6L6 tubes in output, with unmatch output transformer. Sale Price \$49.50.

AIR KING

Portable

Wire Recorder

Plays and Records on Wire from Records or Mike

A-725 Air King wire recorder. Comes complete with mike ready to record on wire from mike or records. Unique mechanism allows records to be played or recorded. Contains an amplifier housed in an attractive leatherette covered case. One of the best wire recorder values. Weight 40 lbs. A-725. Net Price \$69.50.

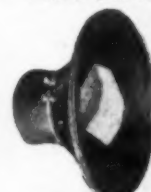


NET
\$69.50

ALTEC LANSING AMP. KIT

10576 Kit \$54.00

603-B \$63.00



"For the romantic breed, who are never satisfied until they build their own." Altec Lansing 10576 Amplifier kit. The Altec Lansing 10576 15 watt amplifier kit contains all the special parts to construct the famous Altec A-323B amplifier. This is the amplifier, especially designed for the highest quality reproduction of music, which has astounded the musical world with its simplicity of connection, exceptional ability to deliver power over a wide range of frequencies, and freedom from hum, noise, harmonics and intermodulation distortion. The A-323B amplifier has built into it all the gain and the proper equalization for the new magnetic phono pickup cartridges such as the General Electric and Pickering. No pre-amplifier or gadgets are required. The Altec Lansing 10576 amplifier kit contains the following parts: Output transformer, power transformer, low pass equalizer choke, punched and painted chassis, chrome eutecton plate, schematic and pictorial diagram and resistor-capacitor mounting board. All other parts, such as tubes, sockets, resistors, capacitors, switches, wire, etc., are standard and readily available.

By purchasing the A-323B in kit form, a considerable saving in cost may be effected. Assembly requires only a few hours and is both simple and informative.

The completed amplifier has a phono input gain of 117 db and radio input gain of 77 db. Frequency response 20 to 20,000 cycles plus 1 db. Continuously variable 6 db bass boost at about 75 cycles from flat bass response. High frequency equalization is 4 position low pass filter which allows either flat, high frequency response or sharp cut-off at 8 kc, 6 kc, or 4 kc. This system gives sharp cut-off of noise yet allows full reproduction of useful high frequencies and is quite different from usual resistor-capacitor treble tone control. Amplifier has phono input with gain and proper equalization for variable reluctance phono cartridges. Has three output impedances: 8.5 to 5, 8 to 12 and 16 to 24 ohms. Tubes required are 2-6J7, 1-6J5, 2-1G6 and 1-6U4G. The dimensions are 9"x12"x9". Shipping weight 15 lbs. Altec Lansing 10576 kit less tubes. Net price \$54.00. Model A-323B Altec Lansing amplifier complete as pictured above with tubes \$133.00. Speaker recommended: Altec 603-B Net \$63.00. 15" Altec Lansing 603B Multi-Cell Dione is a completely new type PM speaker. Rated at 25 watts with a 3.8 ohm voice coil. The metal high frequency diaphragm operates into a multicellular horn. Frequency division is accomplished mechanically. Weight 20 lbs. Net Price \$63.00.

8 in. Coaxial P.M. \$6.95

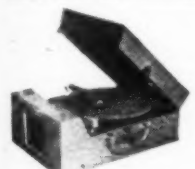
8" Heavy Duty PM speaker, with 2" tweeter. This coaxial arrangement has its own hi-pass filter. Makes one of the best sounding speakers ever built. Stock No. 1045. Net Price \$6.95.



plifier. Diagram included. Price \$7.95.

Children's Player Kit \$7.95

New, children's electronic player. Offered in kit form. Includes all material necessary. Attractive red plywood cabinet, self-starting phono motor and crystal pickup. 4x6" PM speaker and parts to build 70L7 amplifier. Stock No. LD-1. Net



necessary parts to build 70L7 amplifier. Stock No. CK-1. Net Price \$9.95.

Portable Player Kit Scoop \$9.95

Deluxe portable electronic record player kit. Includes all parts and easy to wire diagram. Comes complete with grey leatherette portable carrying case self-starting phono motor, pickup, 5" PM speaker and all



RECORD PLAYER \$13.95

Complete record player. Component parts shipped separately. Amplifier is ready wired and tested. Amplifier has three tubes, 12SQ7, 35Z5, 50L6. All parts are included, self-starting phono motor, crystal pickup, 5" heavy duty PM speaker and amplifier, with tone and volume control. Deluxe heavy wooden case is covered with brown leatherette and has chrome fittings and speaker grill. Stock No. CC-2. Net Price \$13.95.



Deluxe Record Player \$19.95

Our Deluxe portable record player, with a ready wired and tested push-pull 7C5, 4 tube amplifier, with tone and volume control. All parts are included, self-starting phono motor, heavy duty 5" PM speaker, crystal pickup and beautiful two-tone brown leatherette

covered case, sturdily constructed of heavy plywood. Only a few minutes time is required to slip this unit together. Stock No. DL-3. Net Price \$19.95.

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SEND 25% DEPOSIT—BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI

November, 1948

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RADIO DEALERS—SAVE ON ALL RADIO AND ELECTRONIC EQUIPMENT AT McGEE PHONO PICKUPS-CARTRIDGES-CHANGERS-MOTORS



BIG SAVINGS ON CARTRIDGES

Astatic MLP-1 cartridge used in Webster Chicago and many other original equipment changers, with needles \$1.49

Astatic MLP-2 improvement over the MLP-1. Has quiet type QT needle, no surface noise. Scoop price \$1.95

Standard L-40, L-26, cartridges, old standbys, thousands in use. Complete with rest clip. Each, \$1.49

Astatic L-70, L-75, cartridges. Each, \$1.49

Astatic L-72A 3 1/2 volt output, used in one lung record players, etc. Also where tone networks are used. \$1.49, 10 for \$13.00

NJ-1 Nylon cartridge with permanent, but changeable needle. \$3.29

RCA magic-tone cell, with permanent sapphire needle. Modernization kit replaces 95% of old cartridges in RCA radio phonographs, built during 1938 and later. 4 page instruction book included. A scoop at only \$1.95

VOLT-OHM-METER \$29.95

Jackson Model 643, new condition, push-button type Volt-Ohm-Meter. 1000 ohms per volt sensitivity. Measures volts AC or DC to 1000 in 5 steps. Ohms, low, medium and high ranges. 3 mil scales. A scoop at only \$29.95.



Hammarlund Hq-129 receivers. Only six of these to sell, at less than our cost. All new and factory cartoned. Rush your order. Only the first six orders can be honored. Scoop price \$129.50. Also, only one Super Pro. Net \$249.50

GET YOUR GLASSES AND LOOK THESE OVER

40 ft. No. 16 Leadin, rubber covered and stranded. Special. 19c
I.C.A. Universal AC-DC line cords. \$1.00 value. Special. 49c
8 ft. G.E. AC line cord and plastic coated plug. 24c
10 for \$2.00
6 1/2 ft. G.E. AC line cord and plastic bakelite plug. 16c
10 for \$1.50
2 gang condenser, 2 I.F.'s, loop, and oscillator coil, matched. Special. \$1.29
Finest 450 I.F. transformers. Matched. You can't beat this. Each. 49c
Pee Wee Iron Core 450 I.F.'s. A hot value. Each. 39c
10 watt wire wound resistors, all sizes. 19c
25 watt wire wound resistors, all sizes. 25c
67 1/2 volt "B" wafer cell, best quality. \$1.39
5 for 6.50
High grade Grill Cloth, brown or grey, 48" wide, 1 yd. \$1.49
Spagetti tubing, 1/4" bundle ass'd 9" long. Special. 19c
3 or 4 wire oscillator coils, 456 special. 15c
Bronze dial cable, as used on old sets. Spec. 100 ft. 99c
2 watt Neon lamp. Standard base, 35c value, spec. 19c
10 for \$1.50
Hi-impedance Army head phones. Civilian type band and cord. special. \$1.49
Loop antennas. Small, medium and large. All late production. Special. 29c
38/62 Holder. Made by Division Lead Co. Good quality. Special. 49c
50 MA. AC-DC chokes. 39c, 75 MA. 59c
5016 output transformers, 3Q5 outputs. 39c, 10 for \$3.50
4 watt universal output transformers. 75c
8 watt universal output transformers. 95c
12 watt universal output transformers. \$1.25
60 MA Stancor Bush-mounting 6.3v, 5v transformers, for 5 and 6 tube sets. \$1.49
60MA Uprite transformers 6.3v, 5v transformers. special. \$1.95
Filament transformer, 1 amp, 6.3 volts, special. 99c
4 mfd. metal case C.D. oil-filled condenser 600v. Spec. 39c
New Astatic curved arm pickup, less cartridge and base, special. 29c
Large 3 heat switch as used in electric stoves, spec. 39c
350 MA 6 Henry 82 ohm choke, insulated to 2500 volts, special. \$1.95
10 boxed General and Stancor transformers, chokes for older sets. You can't lose, or we will refund your money. Special. \$2.95
Phono-combination, 5 tube AC-DC radio chassis and automatic changer in good walnut cabinet. Shipped in separate pieces, 15 minutes to assemble. Net. \$29.95
10" wall baffle, Walnut. Special. \$2.95
Walnut blank cabinets, 14" long, 8" high, 2" deep. Will hold most mantle sets. Special price \$2.95.
40-44-46-47 G.E. and Westinghouse panel lamps, 10 for \$4.95, 100 for \$4.50
Permeability tuners, band type. Can't backslash, by Electronic Lab. Special. 99c
Ballantine 78 RPM rim-drive phono motor, with turntable. Special. \$2.95

General Electric VARIABLE RELUCTANCE CARTRIDGES \$3.95



Genuine G.E. Variable Reluctance pickup with permanent needle; with jewel. This unit has been publicized so much, nothing need be said. Scoop price \$3.95

CALTRON VARIABLE RELUCTANCE CARTRIDGES \$2.95

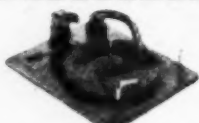


Genuine Caltron Variable Reluctance pickup cartridge, with permanent needle. Mounts in as easy as the G.E. Use in many professional arms. As used in recording and studio work. Very Special Net price \$2.95



CRYSTAL PICKUPS ON SALE

Plastic arm Webster, light weight, normal output Sale price \$1.49.
Astatic L-70 curved arm pickup \$1.95.
Shure glider, normal output pickup \$1.95.
Astatic O-7 straight arm off-set head pickup \$1.95.



SENSATIONAL SALE

On Popular Changers

Seeborg Intermix \$29.95

Triple Post Seeborg Intermix changer. The best value in America today \$29.95
Aero Single post changer, base size 12 x 13" Permanent needles, net 14.95
General Instrument, single post changer, base size 11 x 12", the best 14.95
Farnsworth changer, 2 post with variable reluctance cartridge, net. 19.95
VM-200 twin post changer a scoop at only 13.95
VM-400 twin post changer, inter-mix 10 and 12" records, sale price. 19.95
Individually designed leatherette covered bases for any of the above listed changers, each, \$1.95.

TIME SWITCH \$4.95

Self-starting Electric Clock; with built in TIME SWITCH. Turns radio or appliance off or on at any pre-set time. Use your radio as an alarm clock. Scoop Price \$4.95



Electric

Clock

\$7.95

Numchron Direct Reading, self-starting clock. A real timepiece. Plastic rosewood case, size 10"x4"x4". Wholesale price \$7.95. Retailers must collect federal luxury tax.

UNDER DASH AUTO RADIO \$50.00 Value—\$31.50

Universal Underdash, 6 tube Auto Radio, with RF stage. Iron core I.F. transformers, new miniature tubes. Size 5 1/2" x 4 1/2" x 12 1/2". Has 5" speaker. Easy to fit any car. Wt. 5 1/2 lbs. Net price \$31.50

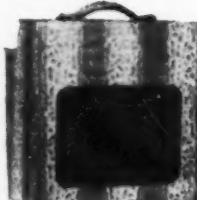
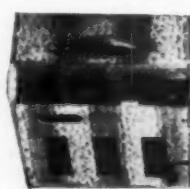


8" SLIDE RULE

DIAL \$2.49

Esc. Plate; Etc., Furnished

\$59.50 VALUE MUSICAL AMPLIFIER WHILE THEY LAST \$24.95



8 watt musical amplifier, 4 tube AC type. Inputs for crystal or dynamic mike and phono or instrument pickup. 2 gain controls and tone control. Has heavy duty built-in 8" speaker. Attractive leatherette covered case. Made by a large manufacture to sell at \$59.95. Brand new, fully guaranteed. For 110 volt AC operation. Our scoop price, \$24.95. Stock No. XR-3. Contact instrument pickup, \$6.95 extra. Deluxe instrument pickup; with volume control, \$8.95 extra. Crystal mike and desk stand \$4.95. Shipping weight, 20 lbs.

3-TUBE MUSICAL AMP. \$19.95

In same deluxe case as the model XR-3 shown above. Has same features except it is designed for instrument pickup only. No input for mike. Stock No. XR-32. Net \$19.95.



G. I. RM-4

\$5.95

G. I. RM-4 Heavy duty phono recording motor, with turntable. A scoop at \$5.95
Deluxe 78 RPM rim-drive phono motor with turntable. Special 2.95
Standard 78 RPM phono motor, with turntable. Special 1.95
Replacement motors for 90% of all automatic record changers. \$1.49, 2 for 2.79



ELECTRONIC MEGAPHONE SCOOP PRICE \$34.95

Only 100 of these Brand New Electronic Megaphones to sell. You may see these listed at a lower price, but ours are new and guaranteed to work. Amplifier straps on shoulder, then just hold megaphone and speak into mike, mounted on rear of projector. Pull switch to turn on dry battery operated amplifier.

67 1/2 volt "B" battery, for personal portable radios. Branded Marvel. Fresh stock. Make extra cash with these. We have sold 2,000 already. Guaranteed. \$1.39, 5 for \$6.50.



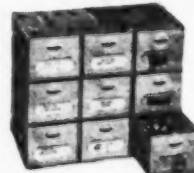
You May Need This Motor Tomorrow

Phono Motor for Record Changers. Fits 75% of all changers built. Rated about 1/100 horsepower. 110 volt 60 cycle. Ideal for experimenters, etc. \$1.49 each, 2 for \$2.79.



MULTI-PARTS DRAWERS

12 for \$4.41



Here is what you have been looking for. Parts bin drawers. Each bin 2 1/2" x 2 1/4" x 5" deep. Ample space for condensers, resistors and small parts. They interlock on all sides, into a sturdy unit. Order as many as you will need.

Net 40c, each, 12 for \$4.41.

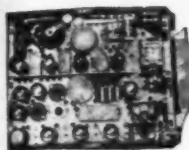
McGEE RADIO COMPANY

ORDER FROM THIS AD
PRICES F.O.B. K.C.

SEND 25% DEPOSIT—BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI
RADIO & TELEVISION NEWS

15-TUBE CIVILIAN BAND TRANS-RECEIVER \$7.95

GENERAL ELECTRIC BC-645A

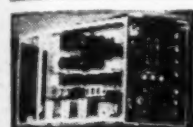


450 MEGACYCLE TRANS-RECEIVER
With Citizen Band-Conversion
Schematic

**1000 TO SELL AT LESS THAN
THE WORTH OF THE TUBES
BRAND NEW**

A small complete Transmitter and superhet receiver, for the 450 megacycle band. Diagrams for building AC power supply and conversion furnished. Ideal for MCW, CW or phone. The tubes (4-7F7, 4-7H7, 2-7E6, 2-6F6, 2-955 and WE-316A) are worth more than our sale price. BC-645 I.F.F. unit \$9.95 each. Two for \$19.00. Extra WE-316A tube 99c. 12 volt DC dynamotor (furnished all power) \$2.95. BC-645 shipping weight 25 lbs.

BC-645A \$7.95 EACH TWO FOR \$15.00



**2-METER
TRANS-
REC.
ARC-4
\$12.95**

FOUR CHANNELS CRYSTAL CONTROLLED. ARC-4 for VHF frequencies 140 to 144 megacycles. There are 7 tubes in the transmitter: 832, two 1614, two 6V6 and two 6L6. The receiver section has 13 tubes: two 6AC7, four 6N7, three 12SJ7, two 12SQ7 and two 12A6. The unit is actually two receivers and one transmitter in one piece. One receiver is for stand-by use. Has built on dynamotor for 24 volt DC operation. Priced complete with tubes and four crystals and dynamotor. Hams convert this for two meter operation. It's a scoop at this price. Used, but good condition. Weight 30 lbs.

**PACKARD
BELL**

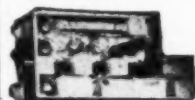
Pre
Amp

\$100

**BRAND
NEW**



Brand new Packard Bell re-amplifier, with tubes 6SL7 and 28D7. In handy size case 5" x 4" x 7". With instruction book. Weight 4 lbs. A scoop at only \$1.00.



BC-733 D Localizer Receiver
Freq. 108-110 Mc; Tube complement:
10 tubes—1—12SQ7, 2—12SR7, 1—
12A6, 1—AH7GJ, 2—12SG7, 3—
717A. Now only \$6.95
BRAND NEW. A RED HOT VALUE.

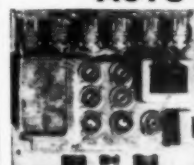
BC-1206 \$4.95

**BRAND
NEW
RECEIVER
195 TO
420 KC**



Designed to receive A-N beam signals. 24-28 vdc. Tube complement: 14H7, 14A7, RF, 14H7, 14J7, 14A7, 14H7, 1F amplifier; 14R7, detector and 1st audio; 28D7, output, 195 to 420 KC 4" high x 4" wide x 6" long. Weight 4 lbs.

AUTO PILOT, SALVAGE SCOOP



\$149 EACH TWO FOR \$249

HAS 6 HIGH RESISTANCE RELAYS

Auto pilot amplifier salvage scoop. Has 6 high resistance relays that operate in tube plate circuits on less than 8 mills. Also 4 controls. Choke cond., etc. Less tubes. Used but in good condition. Weight 12 lbs. Stock No. C-1T. Net \$149; two for \$249.

SCR-518 RADIO ALTIMETER, \$24.95
Complete, New, with 29 Tubes

Famous SCR 518 A Altimeter. Brand new factory cartoned. Worth over \$900.00. Made by RCA. Complete as pictured. Has 29 tubes. Works in the 500 MC region. This is the complete unit. Transmitter, receiver, power supply and 3" scope indicator. Reads altitude up to 30,000 ft. Operates on 28 volts. D.C. Complete with tubes. 6SK7, 2 8012, 2 6SJ7, 6C8, 6SN7, 6F8, 23D4, 6V6, 10 6AC7, 3 2K2, 954, 955, 956, 955 and 3 in. CR tube 1808L. A RED HOT scoop at only \$24.95 complete. Weight 70 lbs.



**AM-61
INDICATOR
AMPLIFIER
Has 15-Tubes
A SCOOP
at Only
\$995**

BRAND NEW

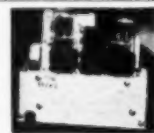
AM 61A Indicator Amplifier. Brand new factory cartoned. Has 28 volt DC Blower motor and fan. 2 2mfd 1000 volt cond. 2 2K .5 mfd. 1000 volt cond. and many other parts. Complete with 15 tubes. 7 6SN7, 3 VR 105, 5Y3, 3 6SL7, 8016. As a salvage item this is a RED HOT Buy. The tubes are worth more than our price. Weight 30 lbs. Net \$9.95.

NAVY-GLIDE PATH \$1.00

**Salvage
SCOOP
BRAND
NEW**



Navy Model ZA Glide Path Receiver. Requires 3-6C6 tubes. A real salvage scoop. Transformer, controls and handy aluminum case. 6" x 7" x 12". All in good condition. Weight 7 lbs. Scoop price \$1.00.



**CRYSTAL
CALIBRATOR
For Collins
Auto Tune, etc.
\$100
LESS TUBES**

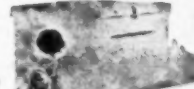
3 tube crystal calibrator: gives 50 KC beat notes for transmitter dial calibration. Requires 200 KC crystal and 2-12SL7 and 12SA7 tubes. A handy item to have. The coils are worth more than our sale price. Wt. 4 lbs. A scoop price for \$1.00.

CATHODE RAY TUBES

5BP4 \$2.95
White Screen.
9LP7 2.95
7BP7 2.95
5FP7 2.95

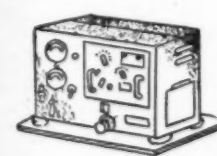
INTERPHONE AMP. \$1.00

**ONLY 250
TO SELL
Brand New**



AM 26 interphone amplifier. This unit is nice for parts salvage and the aluminum case is usable for receiver building etc. Size 9 1/2 x 1 1/2 x 5". Has two transformers, four tube sockets, three filter condensers, three position panel switch, toggle switch, and many small parts. All are in perfect condition.

SCOOP IF THERE EVER WAS ONE
250 ONLY BC-223 BRAND NEW TRANSMITTERS \$395



Brand new BC-223 army transmitters for phone or CW. Requires 3-46 and 2-801 tubes, which are readily available in war surplus. Shipped less plug-in tuning unit; that should be easy to get for a dollar or two. These transmitters are new in wood crates. The 2" 3 ampere RF current meter is worth our sale price. You should not pass up this transmitter scoop; even to tear up for parts, it's a buy. Only 100 to sell. Shipping weight 65 lbs.

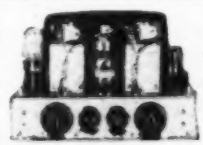
80 METER COMMAND REC. \$4.95

BRAND NEW 454-3 TO 6 M.C. REC., \$4.95

We have a few of the popular 80 meter 3 to 6 mc command receivers in factory cartons. Brand new complete with all 6 tubes. Better place your order now. Weight 8 lbs. New BC-454 \$4.95, each.

BRAND NEW 458 TRANSMITTER, \$5.95

**NEW BC-456 MOD-
ULATORS \$2.49
A SCOOP**

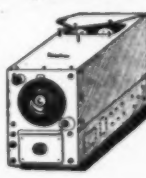


Brand new modulators with tubes, VR-150, 12J5 and 1625. Built for the BC-457 and BC-458 command transmitters. Less dynamotor \$2.49. Used BC-456 modulator with tubes and 28 volt dynamotor \$2.95.

Only a few hundred brand new BC-458 5-7 mc command transmitters, complete with tubes, to sell at \$5.95 each. Weight 11 lbs. A few BC-457 4-5.3 new go at \$5.95 each. Used command triple receiver rack with shock mounting .99 each. Used command twin transmitter rack with shock mounting .99 each.

SALVAGE RECEIVERS \$1.79

Scoop. We have a few hundred BC-453, 454, 455 less tubes; used and cases bent, but still good for parts. Sorry, no choice of frequencies. \$1.79 each.



3" SELSYN INDICATOR
Works on 16 to 25v. 60 cycle
\$245 Two for \$4.45
EACH



CARBON HAND MIKE, 89c

Army carbon hand mike with push-to-talk switch, cord and plug. Brand new and factory cartoned. While they last. 89c each; two for \$1.59; ten for \$6.50.

PULSE FORMING NETWORKS

Used in small radar modulators, available in three sizes, 67 ohms impedance, 7.5 Kilowatt rating.
H-603, one micro second, 200 pulses per second... \$1.00
H-601, three micro seconds, 200 pulses per second... 3.00
H-602, 16 micro seconds, 60 pulses per second... 3.00

NEW APN-1 ALTIMETER...\$9.95

APN-1 Radio Altimeter. A complete transmitter and receiver in one package; for the 120 megacycle region. These units are new and in perfect condition; complete with tubes VR-150, 5-12SH7, 2-12SH7, 2-12H6. Only 100 to sell. Instructions are available for a few units. Weight 25 lbs.

R.D.F. RECEIVER\$19.50

MN-26C Compass receiver. Brand new factory cartoned. This unit covers from 150 to 1500 kc., inclusive; in three bands. Complete with eleven tubes of the 6 volt type 6NA7, 6SK7, 6F6, etc. Has a 28 volt dynamotor built in. This unit does not have a dial included. MN-26C Net price \$19.95. Only a few available.

WHEN ORDERING—Send 25% deposit, with C.O.D. orders. Send full remittance with order less than \$5.00. On parcel post orders, include ample postage. Any extra amount will be refunded.

McGEE RADIO COMPANY

November, 1948

ORDER FROM THIS AD
PRICES F.O.B. K. C.

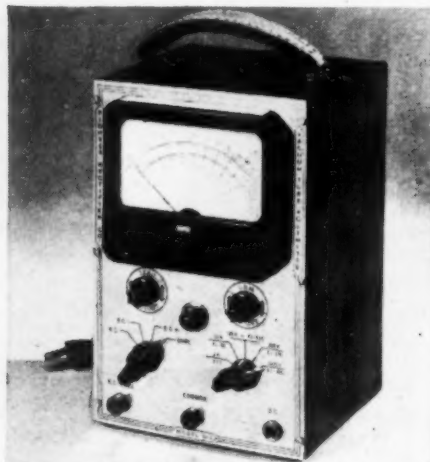
SEND 25% DEPOSIT—BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI

What's New in Radio

RADIO KITS' V.T.V.M.

A high frequency v.t.v.m. in kit form is currently being marketed by *Radio Kits Company* of New York.

The new kit features a linear diode a.c. rectifier and 1% precision resistance for improved high frequency



measurements. The output meter scale is calibrated for a 600 ohm circuit based on a reference level of 1 milliwatt.

The v.t.v.m. measures up to 1000 volts a.c. or d.c. on a 5 range linear scale and up to 1000 megohms in 5 ranges. The kit comes complete with tubes and assembly instructions.

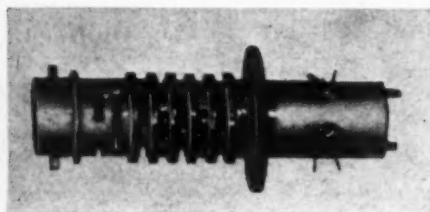
For further information write *Radio Kits Company*, 120 Cedar Street, New York, New York.

COMPONENT LINE

Super Electric Products Corp. of Jersey City, New Jersey, is in production on a line of precision components for the electronic industry.

Of particular interest are the company's high voltage power supply and power supply coil for television applications.

The high voltage power supply unit comes in two models, the SP70 rated at 7000 volts d.c. and the SP90 rated at 9000 volts d.c. Specifications on the



SP70 include a full-load output power of 5 watts, maximum output current of 800 microamperes, full-load, no-load regulation of approximately 13 percent, plate supply voltage 300-315 volts d.c., plate supply current of approximately 60 ma., operating frequency of approximately 280 kc. and a tube com-

plement of one 6V6GT and one 1B3GT/8016. The SP90 has a full-load output power of 8 watts, a maximum output current of 1000 microamperes, approximately 15 per-cent full-load, no-load regulation, 85 ma. plate supply current with 360-375 volts d.c. plate supply voltage, and an operating frequency of approximately 280 kc. The tube complement is the same as for the SP70.

The power supply coil, the Model SPG 10 has a maximum secondary r.f. peak voltage of 10,000 volts, a maximum secondary rectified current of 1000 microamperes, and a maximum rectified power output of 10 watts.

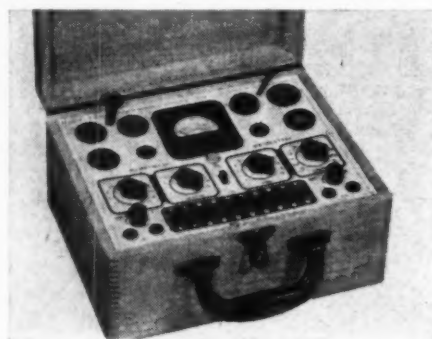
For complete data on these components write to *Super Electric Products Corp.*, 1057 Summit Avenue, Jersey City 7, New Jersey.

TUBE AND SET TESTER

Test-Craft Instrument Co. of New York City has announced the new Model TC-50 tube and set tester.

This all-purpose test unit combines seven instruments; a d.c. voltmeter, an a.c. voltmeter, a d.c. milliammeter, an ohmmeter, output meter, decibel meter, and tube tester. Full scale accuracy to 2% is claimed for the instrument. A "Good" and "Bad" scale is provided for the tube testing function.

The Model TC-50 operates on 90-120 volt, 60 cycle a.c. It is housed in a



portable cabinet and comes complete with test leads, tube charts, and detailed operating instruction. The cabinet measures 8" by 10½" by 5".

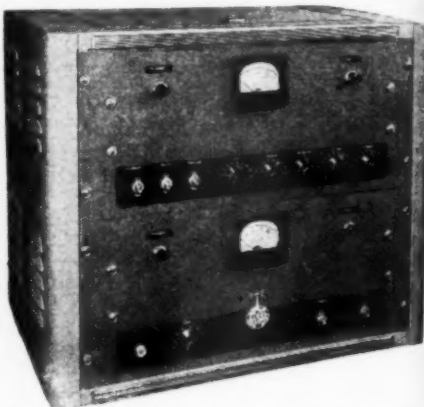
A data sheet covering the Model TC-50 is available on request from *Test-Craft Instrument Co.*, 42 Warren Street, New York 7, New York.

150 WATT XMTR

World Radio Laboratories of Council Bluffs, Iowa, is currently featuring a new amateur transmitter which provides 150 watts input on phone and c.w. on the 10, 11, 15, 20, 40, and 80 meter bands.

The tube line-up of the r.f. section includes a 7C5 crystal oscillator, a 2E26 buffer, a TZ40 final amplifier, with VR150's as voltage regulators, 5R4GY rectifier, and a 5U4 tube recti-

fier for the power supply which is mounted on the same chassis. The modulator in this transmitter consists of a 6SJ7 into a 6N7 phase inverter into a pair of 6F6's as triodes into a pair of 6L6's operating Class B. The modu-



lator also has its power supply on the same chassis.

Static plate current runs 8 ma. and when modulating runs up between 200 and 250 ma.

This transmitter is available in individual sections, as a completely wired unit, or in kit form. Complete detailed description is available on request. Write to *World Radio Laboratories*, 744 West Broadway, Council Bluffs, Iowa.

NEW "SNAP NUTS"

Prestole Corporation of Toledo is currently introducing a new spring steel, self-locking "Snap Nut" which is said to expedite the anchoring of nut-to-panel for blind attachments.

With the new unit no welding, riveting, clinching, or special tools are necessary. The nut is simply pressed into assembly position. It is attached directly from the work surface instead of the reverse side of the panel as is commonly done. It snaps into a ⅜ square hole in panels .037" to .005" thick and is designed for easy entrance of the screw even in cases of extreme misalignment of panels.

As the screw is driven, the arched spring arms of the nut expand just enough to permit entry of the screw, locking the fastener to the inner panel, and at the same time binding against the root of the screw thread. This new fastener will accommodate both No. 8 and No. 10 sheet metal screws, the larger size merely expanding the spring arms. The unit will withstand a tightening torque of 35 to 45 inch pounds.

According to the company, the nut is particularly suited for blind attachments on radios, automobiles, refrigerators, and other mass production products. Samples and further infor-



MORE HOURS OF SERVICE



MICROPHONE CABLES

Belden
Radio **WIRE**

NESCORP ELECTRONICS Presents

RM-29 PORTABLE FIELD TELEPHONE

An ideal portable field telephone. Complete in a rugged steel case for years of wear. Ringer circuit and TS-13 handset. No leather case to deteriorate. Compact 5"x6"x9"—also used as remote control on SCR-284. Simple two wire operation. 15 miles distance and upwards. Lt. wt. 13 lbs. Excellent condition. SPECIAL LOW PRICE. **\$9.95** EACH. 2 for **18.95**

T-178

Carbon Microphone. Like new. A real buy. EACH... **89c**

O-1 M.A.

3rd meter—shunt included for 0-10 M.A. use. New... **\$3.95**

REMOTE CONTROL UNIT RM-12

Has built-in EE-8 with hand set. 3rd DB meter and remote control unit. Used, very good... **\$9.95**

MIKE ADAPTER

M-299 for SCR-522 permits use of carbon mike in place of magnetic. NEW. EACH... **\$1.50**

BC-733D

A 10-tube superhet receiver for lateral blind landing guidance (CAA type certificate) TC-1045. Excellent condition 108-110MC. Tube complement: 1—12SQ7, 2—12SR7, 1—12A6, 1—12AH7GT, 2—12SG7, 3—717A—tubes alone worth more than this low price. **\$4.95** EACH.

Schematics Furnished.

6 VOLT MOTOR

A real beauty, removed from aircraft. Type used for auto fan. EACH... **98c**

6" PM SPEAKER

Beautiful new stock. Alnico mag. net. EACH... **\$1.95**

HEADSETS

HS-23 high impedance, Army Air Force Type, cord and plug, used. EACH... **98c**

CORD CD-370

A ten-foot head set extension cord with a PL-55 Plug on one end and a jack on the other. NEW. EACH... **59c**

R U -18 NAVY COMMAND RECEIVER

Brand New! 187 kc. to 13.95 MC. Marine, aircraft, broadcast, 80 meter, 40 meter band. Complete with plug-in coils for ALL bands! High quality, 3 stages of R.F. 6 tube T.R.F. Filtered 12 V. dynamotor, B.F.O. Extra set of tubes. Remote tuning control—test meter—alignment wrench—junction box—switch box—raincover schematic. Shipped express collect, approximate shipping weight 90 lbs. ONLY... **\$37.50**

WAFFER SWITCHES

10 assorted, rotary, gang. Removed from equipment. ALL... **10 FOR \$1**

BC-1206A

Beacon receiver 200 to 400 K.C.'s 28 V. plate and filament. Easily converted to broadcast band by adjustment of slug tuned coils. Each... **\$5.95**

1625 TUBE Army-Navy Standard

This is a 12 V. filament 807 tube. A tremendous buy. EACH... **29c**
4 for **\$1.00**
Also 1629's, a 12 volt tuning eye, each **29c**

COMPLETE BEAM ROTATOR ASSEMBLY LP-21A and 1-82A

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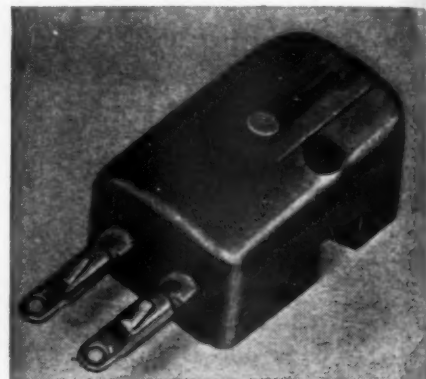
NEW G.E. CARTRIDGE

The Receiver Division of General Electric Company's Electronics Department has announced a new variable reluctance cartridge designed especially for the new long-playing Micro-groove records.

The new cartridge, which features a low mass stylus assembly and high compliance for more faithful tracking, is one-third smaller than previous models. The new, improved shape of the cartridge makes it more universally adaptable to various tone arms. It also affords greater clearance for record changers.

The stylus of the new cartridge is a sapphire, measuring one mil in diameter as required for the new Micro-groove recordings.

According to the company, all prop-



erties inherent in the previous G.E. variable reluctance cartridges are incorporated in this new unit. These include such features as negligible needle scratch and needle talk, minimum record wear, wide frequency response, and freedom from resonance peaks.

The Receiver Division of General Electric Company's Electronic Department is at Electronics Park, Syracuse, New York.

INDOOR TV ANTENNA

Marino Radio Co. of New York is currently in production on an indoor television antenna, the "Telebeam."

Designed for television, FM, and experimental work, this unit is said to be adaptable to all 12 channels and features an exclusive "swivel controlled action" at the base and a built-in tuning stub running parallel to the dipole support.

The set may be installed either on top of the television receiver or may be hooked to a window sill. A special felt underpadding prevents scratching when mounted on the receiver or other furniture.

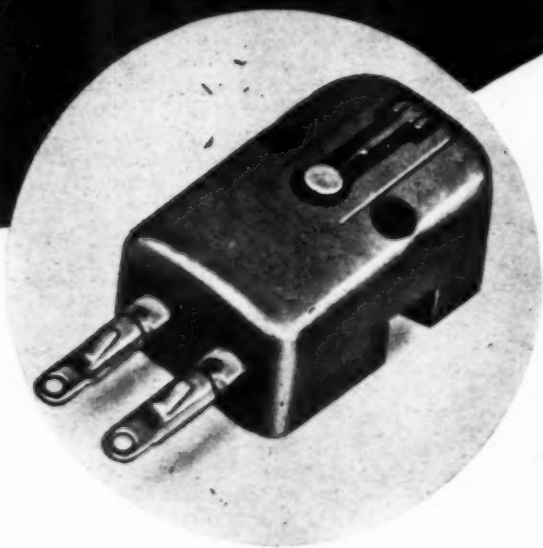
According to the company, the easy-to-operate ring-tuned matching spring stub makes possible increased signal pickup and maximum energy transfer from the antenna to the receiver. The ring is operated either up or down the

(Continued on page 187)

RADIO & TELEVISION NEWS

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Both include inputs for G.E. type pickups.

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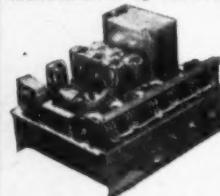
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Screen Grid Modulation

(Continued from page 41)

these tests is shown in Fig. 1, (page 41).

Although a single 6V6 oscillator stage will drive an 813 sufficiently for c.w. operation, it was thought better to use an isolating buffer, both to avoid any chance of modulating the oscillator, and also to insure plenty of drive especially for 10 meter operation, so a 6V6 buffer-doubler was added.

Looking at the diagram, we have a 40 meter 6V6 trit oscillator, doubling to 20 meters in the plate circuit, which, in turn, drives another 6V6 used as a buffer-doubler, whose plate output is tuned to 10 meters. For simplicity's sake, the 813 grid is capacity-coupled directly to the 6V6 plate. No fixed bias is used, as the plate voltage is fairly low and no harm will come to the tube if the final plate is not left off resonance indefinitely. The final plate tank circuit may be varied to suit the taste of the constructor. A single-ended condenser can be used if preferred. An r.f. choke in the plate lead may be required in some cases. A 300 to 400 volt supply may be connected at point "X" on the screen resistor, and the resistor omitted for better regulation of screen voltage.

Two stages of resistance-coupled speech give enough audio drive to the 6V6 modulator tube to sufficiently modulate the 813 screen, with the final plate loaded to full output.

In constructing a compact transmitter it is always necessary to keep the audio and radio frequency leads as short as possible, and to keep each section isolated from the other, or serious feedback, caused by radio frequency current getting into the audio fields, either by induction or by feeding through interconnecting wiring, will result. Where a common power supply is used for both the r.f. exciter and audio sections, it is sometimes necessary to use an r.f. choke with a bypass condenser, either side of it, in the "B plus" lead to the r.f. section.

For push-pull final amplifiers it is only necessary to tie the screens in parallel and tie the modulation transformer secondary in the common "B plus" lead that goes to both screens. The suggested speech and modulation equipment for such an arrangement, would, for crystal or dynamic microphone input, consist of a 6SJ7, resistance-coupled to a 6J5, which is resistance-coupled to a 6N7 phase inverter, which drives a pair of 6V6's. A 10 watt modulation transformer would still do very nicely up to 500 or 600 watts input to the final amplifier. For higher power operation up to a kilowatt, a 25 or 30 watt modulation transformer could be substituted for the 10 watt one mentioned previously and a pair of 6L6's with 300 volts on their plates and screens would be sufficient to handle it.

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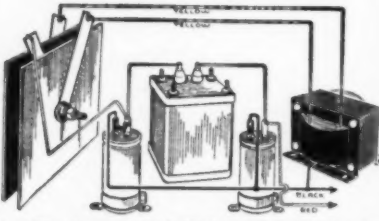


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ten, we have had the pleasure of re-contacting several of the hams over the air who are using this idea, and they are quite sold on it. The quality observed so far is average for plate modulated phone as heard on the amateur bands, with some of it as good as broadcast quality. Those who have worked T12EA of Costa Rica have heard it applied to an 807.

We recently built several 813 jobs, and failing to obtain a suitable modulation transformer for the last one, we resorted to Heising modulation, using a common receiver type filter choke. Again, the quality and percentage of modulation were excellent. A 6F6 type tube seemed to be superior for the modulator, in this system, although the other tubes still worked. 1600 volts was used on the plate of the 813, a common receiver supply of 380 volts was used for the r.f. and audio sections as well as the 813 screen. 6L6's were substituted for the two 6V6's in the r.f. portion and the .0005 grid coupling condenser was changed to a .0001 in order to reduce the grid current to the 813. The developed grid voltage in the grid can be measured by connecting a voltmeter from the junction of RFC₁ and R_e in the grid circuit to ground. It should read around 130 volts for 1250 to 1500 volt plate supply, and may be varied by change in excitation.

As a test this last transmitter was loaded to 400 ma. on the plate with the voltage reading 1500. This gave 600 watts input and a cherry red 813 tube, but the modulation and quality were still excellent.

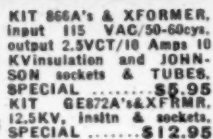
Tuning up for best quality is accomplished by watching the antenna meter or a neon bulb held near the final tank. Load up the final until "upward" modulation is noticed, or until an increase in antenna current is noted when a tone is fed into the speech amplifier. If the 813 plate runs too red to suit you, reduce the input by detuning the oscillator plate tank or by reducing the 813 grid coupling condenser. In all circuits shown, the quality is better if a well regulated screen voltage is used.

Under actual use, when properly adjusted, the plate current milliammeter will show an increased reading under modulation. If this increase is not observed, the reason may be either insufficient plate loading, or a poorly regulated screen voltage supply. The remedy is obvious.

-50-



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V/125A CSD50-800cps & pri taps 200 160 110	
VAC Hmt sealed.	4.50
7.5V/12A HV \$4.95; 4x6.3V/4A&3x5V 4A.	4.50
5VCT/10A/220Vin or 5VCT/10A/110Vin.	4.95
5VCT/20A/220Vin or 2.5VCT/20A/110Vin.	5.95
5VCT/20A/220Vin or 7.5VCT/10A/110V 2A	7.95
3x5/3A.2.5V/1.75A.5V/2A.6.3V/1A.20A	
1200VCT/300ma \$4.50	9.95
3200VCT/120ma & 780VCT, 12CVT.5A.	12.95
700VCT/200ma.115V/100ma.6.3V/2A&6.3V/2A.	
5V/2A CSED HVInsult.	3.29
Universal Vibrator Transf 6.12,2A,115DC&115A	
330VAC 50-60cy.2VCT/85ma.6.3V/3A	2.45
500VCT/300ma @ 120V 115V 220V 250V	3.95
220VCT/300ma Pri110to250V 50-60Cy Inpt&	
2.5V/10A,12V/4.5A,19V/2.5A \$24.95 @ 2 for	47.00
250VCT/60ma.6.3V/1A Small	

13.5Hy/1Amp/42ohm/17KVinsl	\$72.00
15-29Hy/150ma Swinging Cased	2.95
12Hy/300ma \$3.95; 3Hy/40ma—3 for	1.00
15Hy/400ma or 20Hy/300ma/12KV Ms	7.95
8Hy/150ma new UTC crckd Bklt T' Bd 2 for	2.25
50Hy/125ma Csd	1.95
8Hy/100ma/\$1.10; 12Hy/275ma	3.25

Amazing 1W XMTR basic assy consisting of metal frame w/10 cont fem receptacle, 140 mmfvar cond, min polystyrene coil socket, dual Xtal socket & male contact socket w/spring locking clip. FULL INSTRUCTIONS, only 20c ea., 6 for.....\$1.00
COMPLETE UNIT w/coils less Xtals.....\$0.39

	(A) 4xtal Holder $\frac{1}{8}$ " pins 3/4&	
	$\frac{1}{2}$ " spacing 10c @ 12 for.....	\$1.00
	(B) Hi from Twin xtal holder	
	FT243 10c @ 12 for.....	1.00
	(C) HF xtal Holder $\frac{1}{2}$ " spacing	
	$\frac{1}{8}$ " pins 10c @ 12 for.....	1.00
	(D) Johnson Mycalex 3 pin	
	BENDIX & WE ea.	.35

(A) 831R/SQ239 Re-
ceptacle 35¢ @ 10 for... \$3.25

(B) 831SPN/PL259A PLUG 40¢ @ 10 for... \$3.75

(AB) PLUG & SOCKET 831RSPN 70¢; 10/6/75... 3.00

(C) AN3182-85-18 PLUG 35¢ @ 10 for... 3.00

831H/3650 HOOD 11¢ @ 10 for... 1.00

831H/3650 HOOD 11¢ @ 10 for... 1.00

10/702/4605335 PLUG 25¢ @ 10 for... 2.00

10/628/46RR55-PLUG BR 25¢ @ 10 for... 2.00

(E) UG9U PLUG 1.00 @ 10 for... 10.00

(E) 91-MC4M MIKE Amphenol Plugs 35¢; 10/3/0... 10/3/0

(F) UG22/U PANEL JACK .145 @ 10 for... 12.50

UG 21/U PLUG 1.00 @ 10 for... 10.00

UG 21/U PLUG 1.00 @ 10 for... 10.00

PLUG FOR SCR522/P58 Dynatronics 6.00

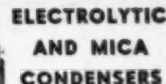
JONES 201 HX PLUG & Socket 49¢ @ 10 for... 4.90



GE GL434A similar to 7C29 TRIODE
useable maxinput 110mc/s UP to 1200
Watts input. UP to 600W output. 3
Terminal Grid & C.T. filament, forced
air Cooling 75-200CFM. Ef 10-11V. Design
for RADAR/BC-677 operated 215mc/s/
12KV/310ma input.

"TAB" SPECIAL	\$7.95
7836ACORN similar 6J4	1.98
9LP7 Magnetic DEFL & FOCUS Suitable for TELEVISION	3.98

02A4G	3.84	687	\$0.87	922	81.45
1B3GT	2.00	6847GT		54 923	
1B21/471	2.95	685F		71 931A	3.95
1B24	2.95	686GT		60 954	
1B27	3.95	688GT		71 955	
1B37	3.95	688GT		63 956	
1E7GT	1.39	687GT		72 957	
1GGGT		68K7		58 958A	
1L4	70	68L7		58 991	
1LC6	1.05	68N7GT		55 1613/6P6N	
1LH4	1.05	68T		54 1614/6L6X	1.50
1P5GT	1.05	68S7		71 1619	
1P5GT	63	6V6GT		49 1622	1.60
1P24	2.95	60U7G		58 1624	
1R4/1294	1.00	6N4		53 1625	
2A1PA	2.85	6N5		61 1626	
2A3	2.85	6N6		59 1627	
2C3/1042	81	6Z4/4		49 1635	1.10
2C26	59	6Z7GT		1.23 1641	
2C34/RK34	55	7B7P/1813		53 2050	
2C40/446A	81	7C29/434		7.95 2051	
2C43	2.98	7C4/1203		45 7193	
2E22	1.45	91P12		4.35 8012	4.70
2E22/HY65	2.95	91P7		4.35 8013A	4.70
2J21/725	12.95	10Y		60 8020	3.40
2J26	12.95	12A6		49 9001	
2J30	18.50	12AH7GT		60 9002	
2J31	16.50	12B7		95 9003	
2J32	16.50	12D1P7		14.75 9004	
2J33	14.50	12GP7		14.75 9006	
2J34	18.95	12S8A7GT		58 C6J	4.90
2J42/700	29.95	12S8GT		65 C296	3.90
2J49	29.95	12S187		60 R123/604	1.10
2J55	29.95	12S187		55 CK1005	3.90
2J61A	3.95	12S9GT		58 F127A	18.90
2K25	9.95	12N3		90 FG104	14.90
2K28	7.00	15E	1.39	FG105	11.90
2K29	6.95	24G/3C24		68 FG166	49.90
2V3G	1.05	35L6GT		60 H123/604	1.10
2X2	5.95	25Z5		58 HE265/2E25	3.90
3A4	70	35L6GT		53 WY15A	1.80
3B7/1291	95	35Z5GT		45 RX215	7.90
3B21	1.27	37		78 T200	12.40
3BP1	1.49	41		70 9000/OBS	7.90
3BP1A	2.95	40L6GT		58 VR92	
3C23	3.95	80		52 VR105	
3E26/1299	85	83V		1.10 VR150	
3E29/820B	3.85	11T26	1.05	WL468	9.90
3FP7	3.95	205B/VT2	1.98	WL530	49.90
3J12	2.95	211		69 WL531	
3S4	4.95	211		69 WL531	
4J37	39.95	250TLT	19.49	WL632A	12.90
5A1P	2.75	304TLT	1.95	UX6653	2.90
5BP1/50P1	1.95	304TLT	1.98	TUNGAR	2.90
5BP4	3.95	305A/RX95	4.25	20 672A	
5CP1	2.85	388		58 672A	
5D21	3.95	388	5.95	289881*	
5H1P	4.95	450H/TH		MAZDA PL*	
5HP1	4.95	6C21	24.90	49**Box 10	
5R4G	1.25	450TLT	29.95	64**	
5T4	1.25	527/1000S	11.95	86**	
5U4G	3.55	631P1/8N1	3.95	100**20V**	
5V4	8.95	701A	3.95	313/28V**	
5Y3	3.85	702A	3.49	323/3V**	
5Z3	89	703A	4.90	Aviation Lgts	
5Z4	88	704A	1.75	44-25 for 1.0	
6A87	98	705A	2.25	44-25 for 1.0	
6A87	98	705A	2.25	4522/250W	
6A87	98	710A/8011	7.75	4560/600W 3.5	
6A87	98	717A	1.49	NEON BULBS	
6AJ5	98	722/287A	9.95	NE2-	
6AK5	90	723AB	5.50	100Qty	4.90
6AK5	1.11	726A			



Year	Number	Year	Number	Year	Number
1991	100	1992	100	1993	100
1994	100	1995	100	1996	100
1997	100	1998	100	1999	100
2000	100	2001	100	2002	100
2003	100	2004	100	2005	100
2006	100	2007	100	2008	100
2009	100	2010	100	2011	100
2012	100	2013	100	2014	100
2015	100	2016	100	2017	100
2018	100	2019	100	2020	100
2021	100	2022	100	2023	100
2024	100	2025	100	2026	100
2027	100	2028	100	2029	100
2030	100	2031	100	2032	100
2033	100	2034	100	2035	100
2036	100	2037	100	2038	100
2039	100	2040	100	2041	100
2042	100	2043	100	2044	100
2045	100	2046	100	2047	100
2048	100	2049	100	2050	100
2051	100	2052	100	2053	100
2054	100	2055	100	2056	100
2057	100	2058	100	2059	100
2060	100	2061	100	2062	100
2063	100	2064	100	2065	100
2066	100	2067	100	2068	100
2069	100	2070	100	2071	100
2072	100	2073	100	2074	100
2075	100	2076	100	2077	100
2078	100	2079	100	2080	100
2081	100	2082	100	2083	100
2084	100	2085	100	2086	100
2087	100	2088	100	2089	100
2090	100	2091	100	2092	100
2093	100	2094	100	2095	100
2096	100	2097	100	2098	100
2099	100	2100	100	2101	100
2102	100	2103	100	2104	100
2105	100	2106	100	2107	100
2108	100	2109	100	2110	100
2111	100	2112	100	2113	100
2114	100	2115	100	2116	100
2117	100	2118	100	2119	100
2120	100	2121	100	2122	100
2123	100	2124	100	2125	100
2126	100	2127	100	2128	100
2129	100	2130	100	2131	100
2132	100	2133	100	2134	100
2135	100	2136	100	2137	100
2138	100	2139	100	2140	100
2141	100	2142	100	2143	100
2144	100	2145	100	2146	100
2147	100	2148	100	2149	100
2150	100	2151	100	2152	100
2153	100	2154	100	2155	100
2156	100	2157	100	2158	100
2159	100	2160	100	2161	100
2162	100	2163	100	2164	100
2165	100	2166	100	2167	100
2168	100	2169	100	2170	100
2171	100	2172	100	2173	100
2174	100	2175	100	2176	100
2177	100	2178	100	2179	100

[illegible]

Mfd.	WVDC	Each	Mfd.	WVDC	Each
(C) Lus Term.					
.0002	500	\$0.30	.0012	2500	\$0.40
.0003	600	.30	.002	600	.30
.00089	1200	.45	.0035	2500	.40
.001	500	.30	.0043	2500	.40
.001	750	.40	.005	600	.40
.002	1200	.50	.005	2500	.40
.003	600	.50	.005	3000	.40
.0039	2500	1.10	.0051	1200	.40
.005	600	.30	.006	2500	.40
.005	1200	.70	.0062	1200	.40
.006	600	.30	.01	500	.40
.008	600	.30	.01	1200	.40
.0082	2500	1.45	.01	2500	.40
.01	600	.45	.013	2500	.40
.01	1200	1.12	.015	2500	.40
.01	2500	1.64	.02	600	.40
.026	500	.92	.03	600	.40
.03	600	1.00	.033	1200	.40
.043	600	1.65	.033	600	.40
			.05	1200	.40
(D) Screw term.					
.0004	2500	.36			
.00047	2500	.39			
.00053	600	.30			

**THAT'S
A
BUY**

DEPT. 11 RN SIX CHURCH ST. NEW YORK 6, N.Y., U.S.A. - CORNER CHURCH & LIBERTY STS.

**THAT'S
A
BUY**

"TAB" MONEY BACK GUARANTEE
\$3 MIN. ORDER F.C.B. N.Y.C.
ADD SHIPPING CHARGES AND
25% DEPOSIT. PHONE WO 2-723

*It's Only
Natural*

FOR RADIO MEN TO ASSEMBLE THEIR OWN

Heathkit ELECTRONIC SWITCH KIT DOUBLES THE UTILITY OF ANY SCOPE



\$34⁵⁰

...two separately controllable traces with individual inputs on any scope.
See both the input and output traces, locate distortion, phase shift, etc., immediately.

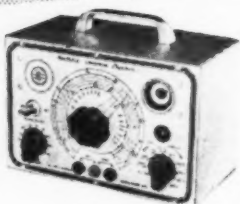
Individual gain controls and positioning control. Coarse and fine sweeping rate controls. Complete Heathkit matches others, with 5 tubes. All metal parts are punched, formed and cadmium plated. Complete with tubes, all parts, detailed blueprints and instructions. Shipping Wt. 13 lbs.
Nothing ELSE TO BUY

- ★ Save 2/3 the cost.
- ★ Gain valuable knowledge.
- ★ Achieve better workmanship.
- ★ Learn many new applications.
- ★ Ideal training for use.

Heathkits are regular factory quality test equipment unassembled but with all forming, punching, calibrating and printing already completed.

HEATHKIT CONDENSER CHECKER KIT

A condenser checker anyone can afford to own. Measures capacity and leakage from .0001 to 1000 MFD on calibrated scales with test voltage up to 500 volts. No need for tables or multipliers. Reads resistance 500 ohms to 2 megohms. 110V 60 cycle transformer operated complete with rectifier and magic eye indicator tubes. Easy quick assembly with clear detailed blueprints and instructions. Small convenient size 9" x 6" x 4 3/4". Weight 4 pounds. This is one of the handiest instruments in any service shop.



\$19⁵⁰
*Nothing
ELSE TO BUY*

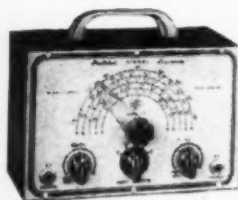
THE NEW HEATHKIT VACUUM TUBE VOLTMETER KIT

The most essential tool a radio man can have, now within the reach of his pocketbook. The Heathkit VTVM is equal in quality to instruments selling for \$75.00 or more. Features 500 microamp meter, transformer power supply, 1% glass enclosed divider resistors, ceramic selector switches, 11 megohms input resistance, linear AC and DC scale, electronic AC reading RMS. Circuit uses 6SN7 in balanced bridge circuit, a 6H6 as AC rectifier and 6 x 5 as transformer power supply rectifier. Included is means of calibrating without standards. Average assembly time less than four pleasant hours and you have the most useful test instrument you will ever own. Ranges 0-3, 30, 100, 300, 1000 volts AC and DC. Ohmmeter has ranges of scale times 1, 100, 1000, 10M and 1 megohm, giving range .1 ohm to 1000 megohms. Complete with detailed instructions. Add postage for 8 lbs.



\$24⁵⁰
*Nothing
ELSE TO BUY*

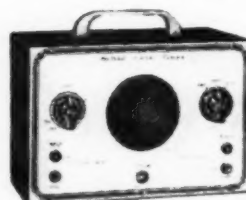
HEATHKIT SIGNAL GENERATOR KIT



\$19⁵⁰
*NOTHING ELSE
TO BUY*

Every shop needs a good signal generator. The Heathkit fulfills every servicing need, fundamentals from 150 Kc. to 30 megacycles with strong harmonics over 100 megacycles covering the new television and FM bands. 110V 60 cycle transformer operated power supply.

400 cycle audio available for 30% modulation or audio testing. Uses 6SN7 as RF oscillator and audio amplifier. Complete kit has every part necessary and detailed blueprints and instructions enable the builder to assemble it in a few hours. Large easy to read calibration. Convenient size 9" x 6" x 4 3/4". Weight 4 1/2 pounds.



\$19⁵⁰
Nothing ELSE TO BUY

HEATHKIT SIGNAL TRACER KIT

Reduces service time and greatly increases profits of any service shop. Uses crystal diode to follow signal from antenna to speaker. Locates faults immediately. Internal amplifier available for speaker testing and internal speaker available for amplifier testing. Connection for VTVM on panel allows visual tracing and gain measurements. Also tests phonograph pickups, microphones, PA systems, etc. Frequency range to 200 Mc. Complete ready to assemble. 110V 60 cycle transformer operated. Supplied with 3 tubes, diode probe, 2 color panel, all other parts. Easy to assemble, detailed blueprints and instructions. Small portable 9" x 6" x 4 3/4". Wt. 6 pounds. Ideal for taking on service calls. Complete your service shop with this instrument.

HEATHKIT SINE AND SQUARE WAVE AUDIO GENERATOR KIT

The ideal companion instrument to the Heathkit Oscilloscope. An Audio Generator with less than 1% distortion, high calibration accuracy, covering 20 to 20,000 cycles. Circuit is highly stable resistance capacity tuned circuit. Five tubes are used, a 6SJ7 and 6K6 in the oscillator circuit, a 6SL7 square wave clipper, a 6SN7 as a cathode follower output and 5Y3 as transformer power supply rectifier.

The square wave is of excellent shape between 100 and 5,000 cycles giving adequate range for all studio, FM and television amplifier testing.

Either sine or square wave available instantly at a toggle switch. Approximately 25V of sine AC available at 50,000 ohm output impedance. Output ± 1 db. from 20 to 20,000 cycles. Nothing else to buy. All metal parts are punched, formed and cadmium plated. Complete with tubes, all parts, detailed blueprints and instructions.

\$34⁵⁰

Shipping Wt., 13 lbs.



The HEATH COMPANY

DEPT. N... BENTON HARBOR, MICHIGAN

TEST EQUIPMENT

New! HEATHKIT FM and TELEVISION SWEEP GENERATOR KIT

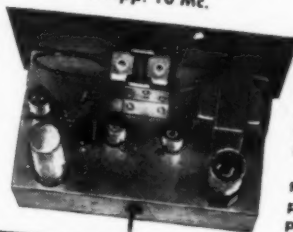
THE BASIC FM AND TELEVISION SERVICE INSTRUMENT

Features -

- ★ Covers 2 Mc. to 226 Mc.
- ★ 110 V 60 cy transformer.
- ★ Supplies either RF or FM.
- ★ Variable sweep width 0 to App. 10 Mc.

- ★ 5 Tube Circuit
- ★ Large calibrated dial.
- ★ Variable phasing control.
- ★ Sweep output for scope.
- ★ No band switching necessary.
- ★ Uses new miniature HF tubes.

At the lowest cost possible, anyone can now service FM and television receivers. The Heathkit sweep generator kit operates with oscilloscope and covers all necessary frequencies. A few pleasant hours assembling this kit puts any organization in position to share the profits of the FM and TV boom. Every part supplied - grey crackle cabinet, two color calibrated panel, all metal parts punched, formed and plated. 5 tubes, complete detailed instructions for assembly and use. Shipping weight 6 lbs.



\$24.50

Enjoy the profits now of this new field

HEATHKIT HIGH FIDELITY AMPLIFIER KIT

Build this high fidelity amplifier and save two-thirds of the cost. Push pull output using 1619 tubes (military type 6L6's), two amplifier stages using a dual triode (6SN7), and a phase inverter give this amplifier a linear reproduction equal to amplifiers selling for ten times this price. Every part supplied; punched and formed chassis, transformers (including quality output to 3-8 ohm voice coil), tubes, controls, and complete instructions. Add postage for 20 lbs.



\$14.95

12" PM speakers for above..... **\$6.95**

HEATHKIT 3-TUBE ALL-WAVE RADIO

110-volt AC operation

An ideal way to learn radio. This kit is complete ready to assemble, with tubes and all other parts. Operates from AC. Simple, clear detailed instructions make this a good radio training course. Covers regular broadcasts and short wave bands. Plug-in coils. Regenerative circuit. Operates loud speaker.

Add postage for 3 lbs.

HS 30 Headphones per set..... **\$1.00**

2 1/2" permanent magnet loudspeaker..... **\$1.95**



\$8.75

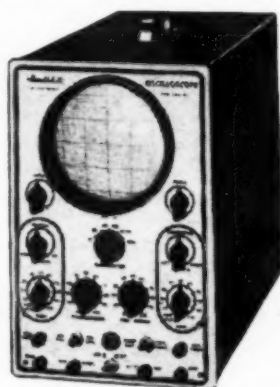
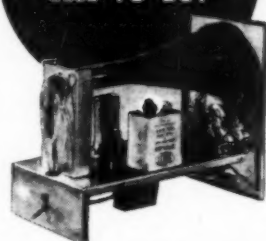
INTERPHONE 2-WAY CALL SYSTEM KIT

Ideal call and communication system for homes, offices, factories, stores, etc. Makes excellent electronic baby watcher, easy to assemble with every part supplied including simple instructions. Distance up to 1/5 mile. Operates from 110 V. A.C. 3 tubes, one master and one remote speaker. Shipping Weight 5 pounds.



\$14.50

\$39.50
Nothing ELSE TO BUY



NEW 1948 HEATHKIT 5" OSCILLOSCOPE KIT

A necessity for the newer servicing technique in FM and television at a price you can afford. The Heathkit is complete, beautiful two color panel, all metal parts punched, formed and plated and every part supplied. A pleasant evening's work and you have the most interesting piece of laboratory equipment available.

Check the features - large 5" 5B1 tube, compensated vertical and horizontal amplifiers using 6SJ7's, 15 cycle to 30 M cycle sweep generator using 884 gas triode, 110V 60 cycle power transformer gives 1100 volts negative and 350 volts positive.

Convenient size 8 1/2" x 13" high, 17" deep, weight only 26 pounds.

All controls on front panel with test voltage and ext. syn post. Complete with all tubes and detailed instructions. Shipping weight 35 pounds. Order today while surplus tubes make the price possible.

110 V. A.C. MILITARY RECEIVER POWER SUPPLY KIT

Ideal way to convert military sets. Supplies 24 Volts for filament - no wiring changes inside radio. Also supplies 250 V. D.C. plate voltage at 50-60 MA. Connections direct to dynamotor input. Complete with all parts and detailed instructions. Ship. Wt., 6 lbs.

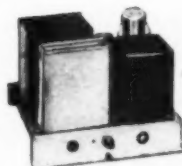
\$ 5.95



110 V. A.C. TRANSMITTER POWER SUPPLY KIT

For 8C-645, 223, 522, 274N's, etc. Ideal for powering military transmitters. Supplies 500 to 600 Volts at 150 to 200 MA plate, 6.3 C.T. at 4 Amps, 6.3 at 4 Amps and 12V at 4 Amps. Can be combined to supply 3-6-9-12 or 24 Volts at 4 Amperes. Kit supplied complete with husky 110V 60 cycle power transformer, 5U4 rectifier, oil filled condensers, cased choke, punched chassis, and all other parts, including detailed instructions. Complete - nothing else to buy.

\$14.50



The HEATH COMPANY

DEPT. N . . . BENTON HARBOR, MICHIGAN

Buy HEATH SURPLUS Now!

ALL QUANTITIES LIMITED SUBJECT TO PRIOR SALES

APN/1 RADIO ALTIMETERS



\$34.50

NO. 200. The last chance to get a complete new 14 tube radio altimeter. Contains 420 Mc. transmitter and receiver, power supply, range switches, two antennas, meter indicator, all plugs and instruction manual. This unit makes excellent amateur station as it is right in the band. Shipped in original export crate. Weight 87 lbs.

G.E. BC 375 TUNING UNIT

NO. 203. Model TU10B covers 10 Mc. to 12.5 Mc. New complete with aluminum cabinet. The best buy of surplus. Over \$30.00 worth of new variable condensers, coil, dials, switches, etc. Add postage for 2 lbs.

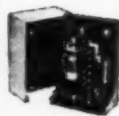


\$2.49

G.E. 50 AMP CIRCUIT BREAKER
NO. 204. New General Electric 50 Amp 220 Volt AC circuit breakers. 100 Amp when used on 110V. Add postage for 4 lbs.

BC 347 AIRCRAFT INTERPHONE AMPLIFIER

NO. 205. Interphone amplifier contains 6F8 tube, Ouncer transformers, diagrams, etc. in aluminum cabinet. Add postage for 4 lbs.



\$2.95

274N COMMAND SET ACCESSORIES



NO. 238. 5" PM Speaker with output transformer matching head-phone output. \$2.80
NO. 239. Dual receiver rack FT277A with connecting plugs. \$1.00
NO. 240. Single transmitter rack FT234A. \$1.00
NO. 241. Spline shaft for tuning command receivers. Allows use of regular tuning knob on BC 453-4-5 receivers. \$.39

BC 451 CONTROL BOX
NO. 236. Control box for 274N transmitters. Contains proper cu-voice switch, 4 channel switch, power switch, mike jack and tele-graph key. Add postage for 2 lbs. \$1.95

METER SPECIAL

NO. 237. Brand new DeJur Model 312 0-800 M.A. D.C. Square 3" 0-10 M.A. basic meter with built in shunt. Probably the best buy ever offered in a surplus meter. Shipping Weight 1 lb. \$2.95

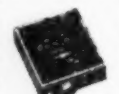


A-62 ARMY PHANTOM ANTENNA

NO. 206. Contains tuning condenser, coil, resistors, tuning dial, tuning indicator, binding posts, steel case, useful for building amateur transmitter. Add postage for 8 lbs. \$1.95

BENDIX MR9C COMPASS CONTROL UNIT

NO. 207. Tuning and control unit for Bendix MN 26 radio compasses contains tuning dial, band switch, crystal switch, AVC switch, volume control, fuses, phone jacks, etc. Shipping Weight 5 lbs. \$9.50

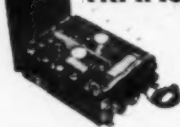


BC731 CONTROL BOX

with Weston Model 476 AC Voltmeter
NO. 208. Excellent buy in motor control box. Size 8"x10"x5 1/2". Contains Weston 0-150V. AC 3 1/2" voltmeter, motor starting switch, 28 fuses all 30 Amp 110V. and 8 fuse holders. Fuses and holders alone worth the price. Shipping Weight 18 lbs. \$7.95



BC 645 GENERAL ELECTRIC TRANSCEIVER



NO. 201. Complete 15 tube transmitter-receiver. Ideal for new citizens band 460 Mc. for communication between office and car, home, boat, etc. Conversion article in August ELECTRONICS Magazine. Brand new in original G.E. cartons with tubes. Add postage for 25 lbs.

\$19.50 ... 2 for \$35.00

ACCESSORIES FOR BC 645
PE101C Dynamotor for car use. \$ 3.95
110V 60 Cycle Power Supply for home or office use. \$14.50

T32 TABLE MICROPHONE

NO. 210. One of the Army's best. Built by Kellogg, ideal for factory call system, public address, amateur use. Brand new in original cartons. Add postage for 5 lbs.



\$2.95

MINIATURE ELECTRIC MOTOR

NO. 211. Tiny Delco motor only 1" x 1 1/4" x 2" 10,000 RPM. Operates from 6 to 24 V. Excellent for models. Add postage for 1 lb.



\$2.95

P. E. 103

6 VOLT

NO. 212. Dynamotor only from PE 103 power supply. Input 6 or 12 Volts, output 500 Volts at 160 MA. Brand new original cartons. Shipping Weight 29 lbs.



DYNAMOTOR



\$5.95



G. E. 1000 VOLT 350 MA DYNAMOTOR

NO. 213. An ideal dynamotor for mobile operation in taxicabs, police cars, sound systems and amateur stations. Supplies above voltage from 12 Volts or 500V. at 350 MA from 6 Volts. Complete with starting relay, and fuses. New. Our Dynamotor A. Shipping Weight 72 lbs.

DM-36 DYNAMOTOR

NO. 215. Western Electric 24 Volt input, 220V. at 60 MA out. With filter assembly. Shipping Weight 6 lbs.



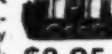
\$2.95

G.E. BC 306 ANTENNA TUNING UNIT

NO. 231. Matches any aerial to 150 Watt transmitter, used on BC 375. Brand new. Add postage for 20 lbs.

W.E. BC456 MODULATOR

NO. 217. Modulator from 274N command transmitters contains 3 husky relays, 3 tubes, VR150, 12J5 and 1625. Brand new. Add postage for 11 lbs.

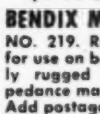


\$3.95



BE 77 TELETYPE TEST SET

NO. 218. Contains zero center volt-milliammeter, switches, relays, voltage divider resistors, neon indicator, etc. Excellent foundation for radio tester. Shipping Weight 10 lbs.



BENDIX MN 20E DIRECTION FINDER LOOP

NO. 219. Ring type loop excellent for use on boat or aircraft. Extremely rugged construction. Low impedance manual type. Add postage for 8 lbs. \$9.95 EACH

LP 18C DIRECTION FINDER LOOP

NO. 220. Motor driven streamline pod type loop used on automatic direction finders. Has Selsyn transmitter and motor, fits most military direction finders. Add postage for 20 lbs. \$14.50 EACH

KIT SPECIALS

POTENTIOMETERS
NO. 232. Kit of 10 excellent shaft type potentiometers good variety \$1.95
SOCKETS
NO. 233. Kit of 20 high quality sockets several different types \$1.00

RCA NAVY COMMUNICATION RECEIVER

NO. 202. The last of these beautiful RCA sets. Covers 195 Kc. to 9.1 Mc. continuously. Supplied complete with tubes, control box, tuning unit, 24 Volt dynamotor, band change motor, plugs and circuit diagram. Superheterodyne circuit covers aircraft, broadcast, short wave, marine, foreign broadcasts. Has sharp or broad I.F.'s B.F.O., etc. Shpg. Wt. 30 lbs.



\$29.50

PE 125 TRANSMITTER POWER SUPPLY

NO. 223. Operates from 12 to 24 Volts and supplies 500 Volts at 160 MA. Extremely rugged construction used in Army tanks. Complete with fuses - relays - filters, etc. Ideal for boats. Shipping Weight 73 lbs.



\$12.95

FM PUSH BUTTON TUNER

NO. 224. Brand new ten push button tuning assembly from Army FM receiver. Contains 4 gang 100 MMF silver plated tuning condenser. Add postage for 10 lbs. \$2.50 EACH



4 PER FOOT

RG 8/U FLEXIBLE COAXIAL CABLE

NO. 225. Standard television lead in 52 ohm. Any length up to 1,000 ft. Add postage.

POWER TRANSFORMER Specials

NO. 226. Primary 117V. 60 cycle. Secondaries supply 746 V.C.T. at 220 MA. 6.3V. at 4.5 A., and 5V. at 4A. Will handle 13 tube radio receivers. Supply is limited, order early. Shipping Weight 11 lbs. each. \$3.95 ... 3 for \$9.95

OUTPUT TRANSFORMER

NO. 227. Push pull 6V6's to 6-8 ohm voice coil excellent characteristics. 3 for \$1.95

TRANSFORMER TRANSFORMER

NO. 228. The transformer for Transmitter Power Supply, 600 Volt at 200 MA and 4 Amp. filaments of 3 to 24 Volts. Also 5 Volts at 4 amperes for rectifier. Shipping Weight 12 lbs. \$9.50

MILITARY POWER TRANSFORMERS

NO. 229. Convert your military receivers without rewiring the filament. "A" type supplies 500 VCT at 50 MA, 5V. at 2A. and 24V. at 1/2 A. "B" type supplies 500 VCT at 50 MA, 5V. at 2A. and 12V. at 1 Amp. State whether A or B type desired. Shipping Weight 4 lbs. \$2.95

HOME WORKSHOP GRINDER KIT

NO. 230. Easily assembled 110V AC or DC ball bearing fully enclosed motor from Army surplus dynamotor. Purchaser to make simple changes and shaft extensions, detailed instructions and all parts supplied. Motor approximately 5,000 R.P.M. Ideal for tool-post grinder, flexible shaft tool, model drill press, saw. Shipping Weight 6 lbs. \$3.95

HEARING AID HEADPHONES

NO. 216. The Army's best - eliminate flat ears and outside noise. Complete with transformer for conversion from low to high impedance. With cord and plug complete. Add postage for 1 lb. \$1.00

TELEVISION CONDENSERS

NO. 221. Tobe triple .2 MFD 4000 V.D.C. Filter used on Army radar. Ideal filter for H.V. television set. Add postage for 3 lbs. \$3.95
NO. 222. G.E. Pyranol capacitor .25 MFD 6000 V.D.C. Porcelain insulated, an outstanding buy for high voltage filters. Add postage for 3 lbs. \$3.95

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The HEATH COMPANY
DEPT. N ... BENTON HARBOR, MICHIGAN

ELECTRONIC BARGAINS for EXPERIMENTERS and HOBBYISTS

ALL QUANTITIES LIMITED SUBJECT TO PRIOR SALES

STANCOR FILAMENT TRANSFORMER

NO. 242. Heavy duty Stancor No. ST355 supplies 5V at 6 Amps, 5V at 3 Amps and 5V at 3 Amps from 220V 60 Cy. primary or 1/2 above from 110V. Cased type. Ship. Wgt. 7 lbs. Each. **\$1.50**



G.E. THYRATRON TRANSFORMER
NO. 243. New G.E. Transformer supplies 2.5V at .100 KVA, has 3KV insulation 100V 60 cy. primary. Shipping Wgt. 13 lbs. Each. **\$9.50**

RCA SATURABLE REACTOR TRANSFORMER

NO. 246. New RCA No. CRV30531 AC current 750 MA DC current 2 Amperes. Rated 1.75 henries. Shipping Wgt. 4 lbs. Each. **\$1.00**

12.6V POWER TRANSFORMER

NO. 247. New cased 110 V 60 cy. Power Transformer. Supplies 440V Ct. at 60 MA, 6.3V at 2A, and 12.6V at 1 Amp. Excellent for military sets. Shipping Wgt. 6 lbs. Each. **\$1.95**

RCA INPUT TRANSFORMER

NO. 248. Heavy duty RCA No. CRV-30529. Input has primaries 600 to 200 and 25 ohms secondary 250,000 ohms C.T. Shipping Wgt. 2 lbs. Each. **\$1.00**

REPLACEMENT POWER TRANSFORMER

NO. 251. Excellent value transformers made by one of largest transformer companies. 110V 60 cy. Primary supplies 746 V Ct. at 150 MA, 5V at 4A and 6.3V at 4.5 Amps. Shipping Wgt. 7 lbs. Each. **\$2.95**

FEDERAL POWER TRANSFORMER

NO. 252. New cased 110V 60 cy. Power Transformer. Supplies 480V Ct. at 50 MA and 6.3 V at 2.1 Amps. A beautiful transformer. Shipping Wgt. 4 lbs. Each. **\$1.50**

HEAVY DUTY 6-12-24 VOLT VIBRATOR

NO. 253. A husky vibrator used on army transmitter. Rated 30 amperes at 6 Volts 220 cycle with contacts for 12 and 24 Volts. Synchronous type, has many industrial applications. Ship. Wgt. 3 lbs. **\$1.50**

4 CHANNEL PUSH BUTTON TUNER

NO. 254. Permeability tuner from BC 728 containing RF, first detector, and oscillator coils. Covers 2 to 5 MC. Complete circuit diagram furnished. Shipping Wgt. 2 lbs. Each. **\$2.50**

CONDENSER SPECIAL

NO. 255. An ideal oil filled power supply filter used in army 16 tube unit, has 2.5, 2.5 and 5 MFD all at 600V D.C. rating. Shipping Wgt. 3 lbs. Each. **\$1.50**

AEROVOX TELEVISION CONDENSER

NO. 256. Aerovox Hyvol .05 MFD at 7500V. rating. Excellent television coupling condenser with mounting bracket. Shipping Wgt. 3 lbs. Each. **\$3.50**

BC 746 TUNING UNIT

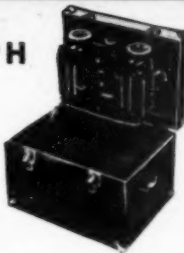
NO. 257. Plug in transmitter tuning unit from army Walkie Talkie. Contains antenna and tank coils, tuning condenser, transmitting and receiving crystals. Ideal transmitter foundation. Shipping Wgt. 1 lb. Each. **\$1.00**
(Same as above except transmitter crystal in 80 meter amateur band \$2.50 each)

T30 THROAT MICROPHONE

NO. 258. Makes excellent contact microphone for musical instrument or vibration pick-up. Shipping Wgt. 1 lb. **\$1.00** each
Extension cord with switch for above .50 each

BRAND NEW ARMY AIR FORCE ASTROGRAPH

NO. 259. The case of this unit makes the finest tool and service kit ever designed. Ply-wood construction, 14 x 11 x 10" high, with 8 covered compartments in the bottom for repair parts, leather handle, steel reinforced covers, hinged lid. Also excellent as case for radio phonograph, movie projector, camera, shell case, fishing kit, picnic kit, etc. The astrograph itself, (which cost the government \$125.00) makes an excellent contact printer, and can be used for a foundation for enlarger, strip map holder, etc. The case alone worth twice the give-away price of **\$3.95**



AN27/ARNS ANTENNA

NO. 260. Standard blind landing antenna system. Brand new in original crate. Ship. Wgt. 14 lbs. **\$9.50**

AS114/APT ANTENNA SYSTEM

NO. 261. New blade type antenna complete with case assembly, in original carton. Shipping Wgt. 9 lbs. **\$7.50**

AS115/APT ANTENNA SYSTEM

NO. 262. New blade type antenna complete with case assembly, in original carton. Ship. Wgt. 11 lbs. **\$7.50**

AT38A/APT RADAR ANTENNA

NO. 263. New radar dome type antenna with mounting base and connections, in original carton. Ship. Wgt. 11 lbs. **\$14.50**

AN104A BLADE ANTENNA

NO. 264. Standard blade antenna used on many military fighting planes with coaxial connection at base. Shipping Wgt. 3 lbs. **\$1.50**

BENDIX MT51C TRANSMITTER CONTROL BOX

NO. 235. Contains channel switch, emission switch, send receive switch, power switch and indicators for Bendix aircraft transmitters. Ship. Wgt. 3 lbs. **\$5.50**

BC 670B REMOTE CONTROL BOX

NO. 265. Motor starting control box has starting and stopping switch, indicator, cable and plug. Wooden case. Ship. Wgt. 6 lbs. Each. **\$1.95**

BK 22 RELAY ASSEMBLY

NO. 266. Used on SCR 269 Radio Compasses. Contains stepping and control relays - junction box of aluminum. Brand new. Ship. Wgt. 7 lbs. Each. **\$3.95**

HEINEMANN CIRCUIT BREAKER

NO. 267. Heavy duty type 7 Amp. 24 Volt D.C. Many uses around shop. Shipping Wgt. 2 lbs. Each. **\$1.00**

CUTLER HAMMER MOTOR FIELD CONTROL

NO. 285. Rated 10 ohms. 3.2 Amps. Maximum. 6 1/2" diameter with knob and mounting feet, can be used to regulate generator output voltage. Shipping Wgt. 5 lbs. Each. **\$2.50**

PENN THERMO RELAY

NO. 268. Thermo Relay with a range of 45° to 100° complete with 5 Ft. flexible cable to immersion bulb. Shipping Wgt. 6 lbs. **\$3.50**

B & W 11 to 14 MC TANK COIL

NO. 281. Plug in type used on BC 610 Transmitter. New, original cartons. Shipping Wgt. 2 lbs. Each. **\$1.50**

DM 64A 12 VOLT DYNAMOTOR

NO. 269. Input 12V at 5 Amps. Output 275 Volt 150 MA. New. Shipping Wgt. 7 lbs. Each. **\$5.50**

DM 32A COMMAND SET DYNAMOTOR

NO. 270. Part of 274N Command Receivers. Input 28 Volts, output 250V at 60 MA. Shipping Wgt. 4 lbs. Each. **\$5.50**

DM 21 12 VOLT DYNAMOTOR

NO. 271. Used in Army BC 312 Communication Receiver. Input 12 Volts at 3.3 Amps. Output 235 Volts at 90 MA. New, original cartons. Shipping Wgt. 8 lbs. Each. **\$5.50**

PE94C SCR 522 POWER SUPPLY

NO. 272. Complete dynamotor power supply for the SCR 522, operates from 28 Volts. Complete with controls, filters, etc. Original cartons. Shipping Wgt. 34 lbs. Each. **\$8.75**

PE101C BC645 POWER SUPPLY

NO. 273. Complete power supply for BC 645. Operates from 12 or 24 Volts. Supplies both AC and DC required. Shipping Wgt. 13 lbs. Each. **\$3.95**

DM 35 12 VOLT DYNAMOTOR

NO. 274. New input 12 Volt at 18.7 Amperes. Supplies 675V at 275 MA or 1/2 above voltage from 6 volts. Excellent for auto use. Shipping Wgt. 11 lbs. Each. **\$7.50**

PE 86 DYNAMOTOR

NO. 214. A popular 28 Volt receiver dynamotor used on present military equipment. Supplies 250V at 60 MA. Shipping Wgt. 4 lbs. Each. **\$5.50**

GN 58 HAND GENERATOR

NO. 275. Makes excellent home lighting plant, operated by wind propeller, waterfall, gas engine, or hand crank. Reduction gear allows full output at slow speed; supplies 6 volts at 2.45 amp., 425 volts at .115 amp. New. Add postage for 28 lbs. Each. **\$7.95**
Handles for GN 58 .50 each
Connecting cord for GN 58 with plugs CD1086 .150 each

COLLINS AUTOTUNE CONTROL HEAD

NO. 278. Brand new controls used on the ART/13, 100 Watt, Transmitter. Types 7, 8, 10, and 11 available. Get a spare while available as new cost is over \$22.00 each. Shipping Wgt. 3 lbs. Price any type (mention when ordering). Each. **\$4.50**

MC 432 VHF ANTENNA LOADING UNIT

NO. 279. Contains 2 pole, 5 position rotary switch with silver ceramic variable condensers, and coils for matching VHF Transmitter to AN109 antenna with 50 ohm line. Many useful parts. Shipping Wgt. 2 lbs. Each. **\$1.50**

148 OUTDOOR TELEGRAPH KEY

NO. 280. Rugged enclosed type for outdoor use, built for army to withstand hard usage. Complete with cord and PL55 plug. Shipping Wgt. 2 lbs. Each. **\$2.00**

ONE KILOWATT ADJUSTABLE ANTENNA LOADING COIL

NO. 282. Huge porcelain coil 4" diameter 8 1/4" long, has 5 sliders for adjustments. Shipping Wgt. 5 lbs. **\$3.50**

300 MA SELENIUM RECTIFIERS

NO. 209. Rated 300 MA at 36 Volts, complete with mounting brackets. Shipping Wgt. 1 lb. **3 FOR \$1.00**

DUAL SELENIUM RECTIFIER

NO. 283. Two units mounted on single bracket, each section rated 15V. at 1/2 Amp. Shipping Wgt. 1 lb. **2 FOR \$1.00**

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WIRE HEAD SOCKET for easy mtg. Polarized, moulded bakelite. Fully shielded. **35c**

WIRE SPOOL HUB. Polished aluminum. Takes standard Recording Wire spool. **39c**

RM-4 RECORDING MOTOR—Heavy duty 110V, 60 cycles. For WIRE, TAPE or DISC RECORD AND PLAYBACK. 3 1/2" sq. x 2 3/4". Less turntable, mtg. plate and reduction drive wheel. Shpg. wt. 6 lbs. **4.95**

ALNICO ERASE MAGNET for TAPE or WIRE. U shape, polished poles, 3/4" x 3/4" x 3/4". **39c**

HIGH VOLTAGE FUSE. Rated 23000 Volts @ 5 amps. Liquid filled. Clip type. 12 3/4" long, 7/8" O. D. Shpg. wt. 2 lbs. **1.89**

RADIO HARDWARE TREASURE. A value-packed assortment of approx. 1000 screws, nuts, washers, lugs, etc. Shpg. wt. 2 lbs. **49c**

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Leotone's "Jumbo Radio Parts Assortment" You can't afford to miss this tremendous buy in new and dismantled radio and electronic parts. 17 full pounds of: Transformers, Coils, Sockets, Wire, Speaker Accessories, Hardware, Resistors, Condensers, etc., etc. All these and much more (shpg. wt. 21 lbs.) for **2.95 ONLY**

"DUNCER" OUTPUT TRANSFORMER (1/2" x 1 1/4") 2000 ohm tapped dble. primary to voice coil. Excellent results with Beam Power tubes **49c**
12 for 5.00

AUDIO TRANSFORMER—3:1, DC resist. 800/7000. Hermetically sealed. 2" x 1 1/4" x 1 1/2". **69c**

RCA VICTOR POWER TRANSFORMER for models R-32, 45, 52 or 75. Unshielded. Shpg. wt. 7 lbs. **5.95**

POWER TRANSFORMER—Heavy Duty. 1000V, C.T. @ 200 MA, (2) 5V @ 2 and 3A., and 6.3V, C.T. @ 6A. Fully shielded. 4 1/2" x 4 1/2" x 3 3/4". Shpg. wt. 12 lbs. **5.95**

MINIATURE SOCKET MTG. PLATES—For mtg. mini-sockets in standard large socket hole. **3c**
10 for 25c

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BONE CONDUCTION RECEIVER. Famous make vibrating armature type. Low impedance. Makes excellent PILLOW or MINIATURE SPEAKER; or CONTACT MIKE. Plastic housing. **2.95**
1 1/2" x 3/4" x 1 1/2" **4 for 9.95**

HEARING AID AMPLIFIER ASSEMBLY. Vacuum tube type (CK501,503). Make a REAL VEST POCKET RADIO, adding only tuner sect. and speaker or phone. Ready wired miniature components include: 2 controls (1 and 4 mecs.), output transformer, dble. choke, switch, resistors, condensers, etc. Complete with schematic diagrams for building a 2 or 3 tube set. Less tubes and case. OVERALL ONLY: 2" x 1 1/2" x 5". WEIGHS **2.49**
3 1/2" OZS. **39c**

MINIATURE ALNICO V MAGNETIC PHONE UNIT. High fidelity, for use with above hearing aid amplifier as PM or pillow speaker. Makes sensitive magnetic or contact mike. 3/4" O.D., 1/2" deep. **39c**

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STOCK UP NOW at up to 80% off list. Perfect condition, unsealed cartons. Most types in stock. All guaranteed for 90 days.

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TUBE CARTONS, Plain White

Miniature (1" sq. x 2 3/4") per 100. **.98**
GT size (1 1/4" sq. x 3 3/4") per 100. **1.25**
Medium (1 1/2" sq. x 4 1/4") per 100. **1.49**
Large (2" sq. x 5") per 100. **1.79**

CHANGER BASE SLIDERS. Smooth ball-bearing action. For side or bottom mtg. Two sizes available: 11" extension. **pr. 1.98**
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A GRID BIAS SUPPLY FOR CLASS "B" MODULATORS

By H. C. SHERROD, W5ZG

Using copper oxide rectifiers, this unit will supply 50 volts at 100 milliamperes.

VACUUM tubes which require grid bias when operated as audio amplifiers or modulators under class B conditions, engender the problem of bias voltage regulation because of the magnitude of the fluctuating grid current.

Satisfactory operation of such units can, therefore, be achieved only through the use of a source of grid bias voltage which has sufficiently low internal resistance to make negligible the IR drop across the source of bias voltage occasioned by the grid current as compared with the magnitude of grid bias voltage employed.

The most common expedient employed to meet the foregoing requirement is the use of batteries to obtain bias voltage.

The advantages of the use of batteries for grid bias are:

1. Relatively low cost.
2. Compactness.
3. Sufficiently low internal resistance.
4. Relatively long life.

Disadvantages of batteries as a source of grid bias are:

1. Eventual rupture of the battery due to charging effect of grid current.

2. Sweating and leaking of batteries at the end of their life, together with the corrosive effect of substances discharged.

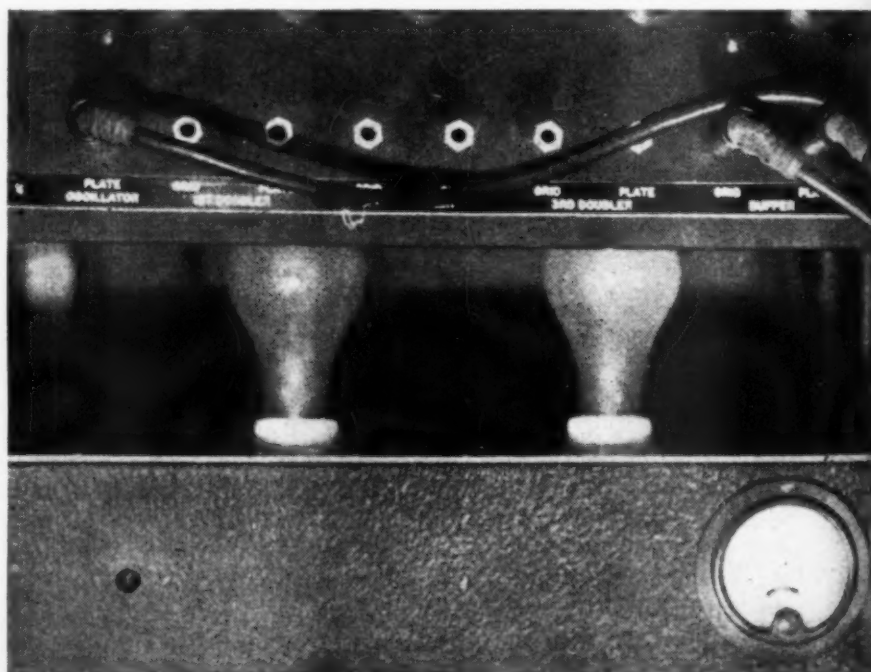
3. Restriction on use of equipment occasioned by failure of the bias battery.

In the writer's case, it was desired to properly bias a pair of Eimac type 35T tubes operating in push-pull as class B modulators at 1500 volts plate potential. To comply with manufacturers' requirements, a bias voltage of -50 was necessary.

Design considerations were based on an assumed maximum grid current of 100 milliamperes for the two tubes.

If then, the bleeder resistance connected across the source of bias voltage carried a current of approximately 2.5 amperes, the resistance of this bleeder would be 50.0 volts divided by 2.5 amperes or 20 ohms. With zero signal on the grids, the current flowing through the bleeder resistance would be 2.5 amperes and the bias 50 volts. With maximum signal on the grids, the current flowing through the bleeder resistance would be 2.5 amperes plus 100 milliamperes (assumed

Fig. 1. Bias supply unit as installed, using 75 watt, 117 volt lamps.



keeping up
with radio



PIEZOELECTRIC CERAMICS

The high-level output, immunity to magnetic fields, lightness, and general operating convenience of the crystal microphone and crystal pickup frequently have been outweighed for some uses by the lack of stability of the piezoelectric element. The rochelle-salt crystal is quickly damaged by excess humidity or high summer temperatures. This situation recently was changed when several manufacturers announced crystal microphones and pickups using ceramic piezoelectric elements which are immune to ordinary heat and humidity. Voltage output is down somewhat from rochelle salt, but this loss is more than compensated by the improvement in stability.

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11th EDITION

32 Chapters of useful reference material on all practical aspects of radio communication on frequencies from 3.5 to 500 Mc.



Twelve chapters devoted to fundamentals of radio communication. Six chapters cover practical aspects of communication antennas and transmission lines. One chapter devoted to electrical and mechanical data on rotary arrays alone! Valuable new information on tuning of antenna arrays and on matching the antenna to the feed line.

Eleven chapters of constructional data on transmitters up to one kilowatt, receivers, broad-band and conventional converters, test equipment, exciters, v.f.o.'s, speech equipment and power supplies.

One chapter is devoted to a compilation of data on the calculation of operating characteristics of all usual types of vacuum-tube amplifiers, including grounded-grid, cathode-follower, and beam tetrode types. One chapter devoted to transmitter design and control principles, with examples of flexible transmitter-control circuits.

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The Only Comprehensive Book for the Beginner

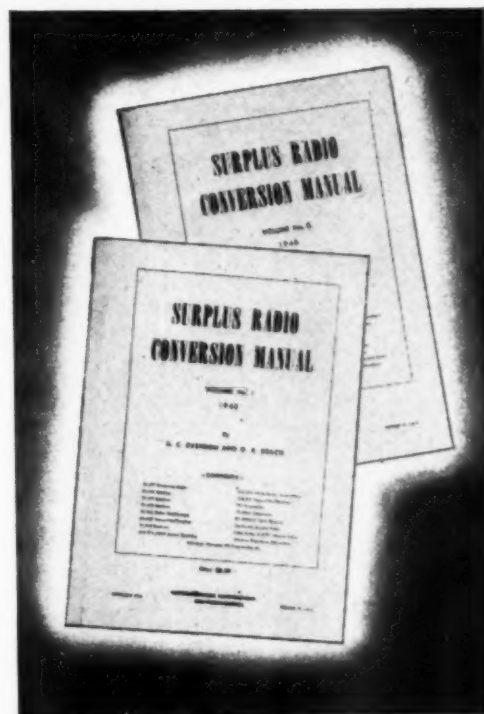


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- Complete section of study questions, including those needed to pass the license exams.
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BC-221 Frequency Meter
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BC-312 Receiver
BC-348 Receiver
BC-412 Oscilloscope as a test scope or as a television receiver
BC-645 420-Mc. Transmitter/Receiver
BC-453A Series Receivers
BC-457A Series Transmitters
SCR-522 144-Mc. Transmitter/Receiver
TBY Transceiver with Xtal Control
PE-103A Dynamotor
BC-1068A V-h-f Receiver
Electronics Surplus Index
Cross Index of VT-Number tubes

VOLUME II

ARC-5 and BC-454 Revrs for 28 Mc.
ARC-5 and BC-457 Tx for 28-Mc. Mobile
ART-13 and ATC Transmitter
Surplus Beam Rotating Mechanisms
Selenium-Rectifier Power Units
Hi-Fi Tuner from BC-946B Rcvr
ARC-5 V-h-f Transmitter
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maximum signal current) making a total of 2.6 amperes and the resulting bias voltage would be 20 ohms multiplied by 2.6 amperes or 50.2 volts.

The maximum variation in grid bias voltage between the limits of zero signal and assumed full signal would be only .4%, a negligible amount. From the foregoing it seemed that a rectifier-filter system delivering 50 volts d.c., having an apparent internal resistance in the order of 20 ohms, and having a low ripple content would adequately serve the purpose intended.

Requirements outlined indicated the use of a rectifier capable of relatively large current output at low voltage. Metallic oxide rectifiers are admirably suited for such purpose and two units of this type (as manufactured by General Electric Company) were selected. These rectifiers are bridge connected and, to insure adequate current carrying capacity, two are employed with the corresponding elements of each unit connected together.

The schematic diagram of the unit is shown in Fig. 2.

Choke CH₁ was made by winding some 300 turns of #18 d.c.c. wire on the core of a discarded receiver power transformer.

Relay RL₁ is a single pole, normally open, midget type, 117 volt a.c. relay with the original winding removed and replaced with a sufficient number of turns of #18 d.c.c. wire to effect closure upon application of load of the two 32 volt, 25 watt lamps used as bleeder resistors and marked B₁ and B₂ in Fig. 2. Points of this relay are connected in series with the solenoid of the relay controlling application of plate voltage, thereby making impossible the application of plate power to the modulator unit until bias voltage is applied.

With the exception of the transformer marked T₁, the components

were initially connected as shown by Fig. 2, but with the a.c. side of the rectifier connected through a rheostat to the 117 volt a.c. line and with an alternating current voltmeter connected to rectifier at a.c. terminals.

Rectifier voltage was varied by the rheostat until voltmeter M read 50 volts d.c. At this condition the a.c. voltmeter across the rectifier read 60 volts.

With the information thus obtained, a 75 watt transformer was designed and constructed to stepdown the 117 volt a.c. line power to 69 volts and all connections made as shown by Fig. 2.

The pilot light, PL₁, is mounted on the front of unit as is the voltmeter M.

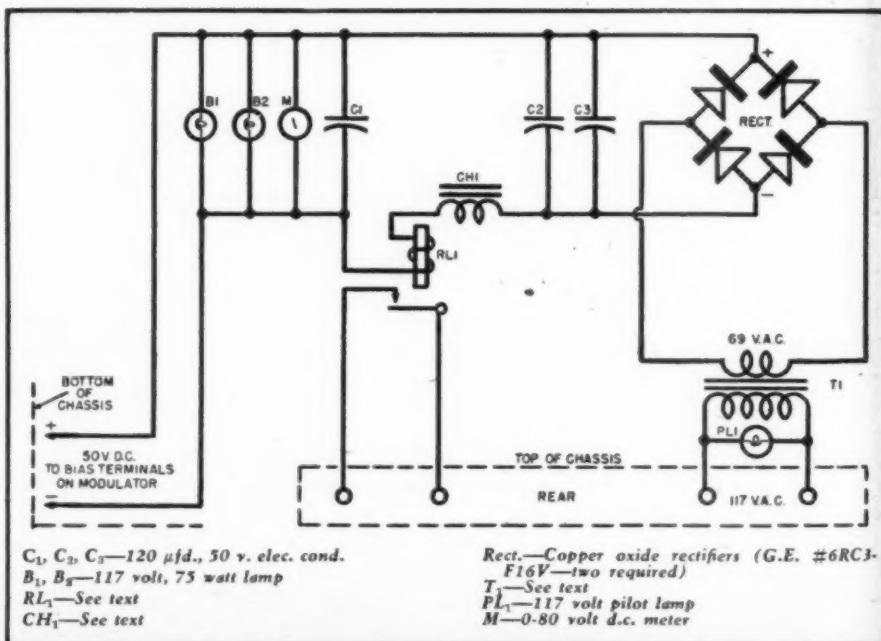
A photograph of this unit as installed in the writer's transmitter is shown by Fig. 1.

This unit has now been in operation approximately three years. To date the only maintenance required has been the replacement of the original 25 watt, 32 volt lamps which was occasioned by their operation at 50 volts. Recently, however, these lamps have been replaced by 75 watt, 117 volt lamps which will have a longer life expectancy because of under-voltage operation. With the 75 watt, 117 volt lamps, grid bias voltage remains constant at 50 volts irrespective of magnitude of modulator grid current. The restrictions which would be placed on the transmitter by failure of bias batteries has now been removed.

It has also been found that a wide range of bias voltages may be obtained by using different combinations of lamps of the same or different wattage ratings.

Range of voltages obtainable may be varied by the use of a rheostat or autotransformer in the 117 volt a.c. side of the line supplying transformer T₁, with regulation improving as bias voltage is increased.

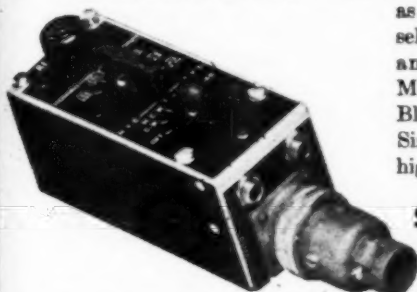
Fig. 2. Complete schematic diagram of grid bias supply.



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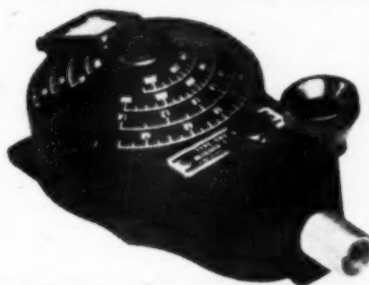
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6SK7GT	50A5
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12A8GT	84/6Z4
12AT6	

55c Each

1A5GT	6U7G
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1H5GT	6X4
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1P5GT	12BA6
1V	12F5GT
2A5	12J7GT
3Q4	12K7GT
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5U4G	12Q7GT
5X4	12SF5
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6AC5GT	12SG7
6AQ5	12SJ7GT
6A8G	24A
6AT6	25L6GT
6AU6	25Z5
6A7	25Z6GT
6A8GT	35
6BA6	35L6GT
6BE6	35Z3
6C5	36
6C6	42
6C8G	43
6D6	45
6F5GT	47
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6K7GT	57
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89c Each

0Z4	1LE3
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1Q5	7C6
1T5	7C7
2A3	7H7
2A7	7Q7
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6AC7	14A7
6B4G	14B6
6C8G	14Q7
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former, Bobbin Core, 10
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YT-127H Horiz. Yoke
Match. and H.V. Trans-
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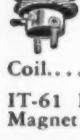
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Low-Cost MULTIMETER

Construction details covering an all-purpose
multimeter for students and radio servicemen.

By ABE SIEGEL

Bradshaw Instruments Co.

IN DESIGNING an all-purpose multimeter for the student and the radio serviceman, the primary considerations are versatility of operation and simplicity of control. In addition, the ideal instrument must be compact, portable, and low in cost.

All of these factors were carefully considered in the design of the Bradshaw Model 30 multimeter, the commercial counterpart of the instrument described in this article.

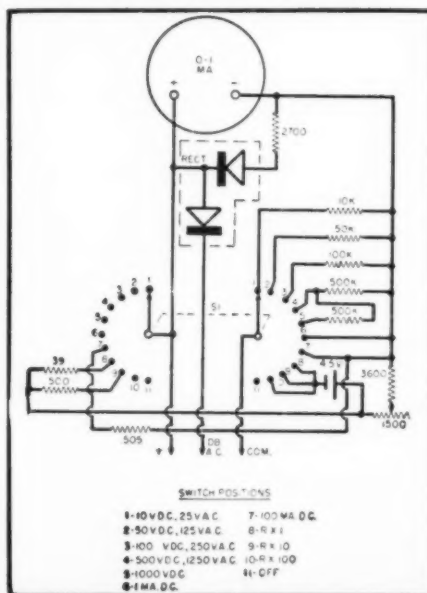
First, the number of controls have been reduced to an absolute minimum. All of the ranges and functions are obtained with one rotary switch, one zero-adjust potentiometer, and three pin jacks. This system simplifies range selection considerably and reduces the possibility of error.

A 0-1 ma. 3½ inch round meter was selected for economy of space and its ability to withstand abuse. The rugged one mil movement will stand up under a fairly heavy physical shock and it can take considerable overload without damage.

A quick glance at the circuit diagram of Fig. 1 will show that the principle of simplicity has been adhered to closely. The same multiplier resistors are used for both the a.c. and d.c. voltage ranges. A two-element copper oxide instrument rectifier gives high input impedance on the a.c. ranges.

The front panel layout of the commercially-built instrument is shown in

Fig. 1. Circuit diagram of the multimeter. All parts are standard and may be obtained from any radio parts supplier.



Front view of the commercially-built multimeter designed for servicing.

the photograph. The instrument is laid out in the long plane so that it may be used upright as well as flat on the test bench. A good arrangement is to place the instrument upright on a shelf at about eye level.

All of the parts used in constructing this instrument are standard and may be obtained from your regular radio parts dealer. The battery used is the Eveready No. 751 which delivers 4.5 volts and is much more compact than the three flashlight cells normally employed in this type of circuit. The battery is mounted on the meter by means of a "U" shaped spring which can be fabricated from a piece of 22 gauge spring brass or phosphor bronze five inches long by one inch wide. The 100 ma. shunt is made of No. 28 Driver-Harris manganin resistance wire. The meter employed in this model has an internal resistance of 500 ohms and requires a shunt of .505 ohms, or exactly 3.35 inches of No. 28 manganin.

For any meter the required shunt resistance is one per-cent of the resistance of the meter movement and may be calculated accordingly.

No sub-assemblies other than the battery spring are required. The rectifier is mounted on the battery spring and all other components are mounted directly on the rotary switch.

This instrument provides the following ranges: 0-25, 0-125, 0-250, and 0-1250 a.c. volts; 0-10, 0-50, 0-100, 0-500, and 0-1000 d.c. volts; 0-1, and 0-100 d.c. ma.; resistance may be measured in three ranges covering 0-10,000, 0-100,000, ohms, and 0-1 meg-ohm.

In addition, the a.c. voltage ranges are calibrated in decibels where zero level is .006 watts at 500 ohms. The db. level is read as follows. On the

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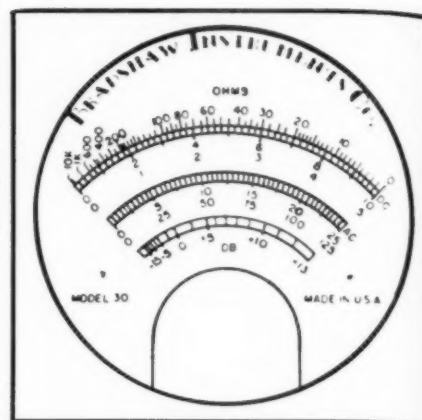
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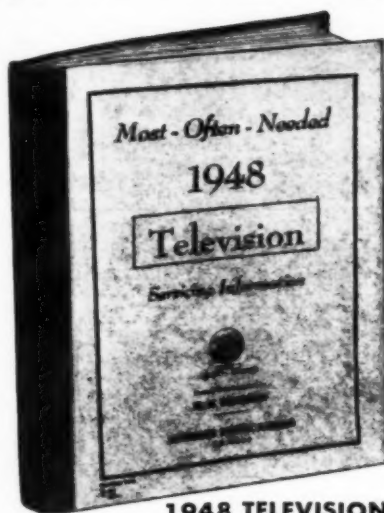
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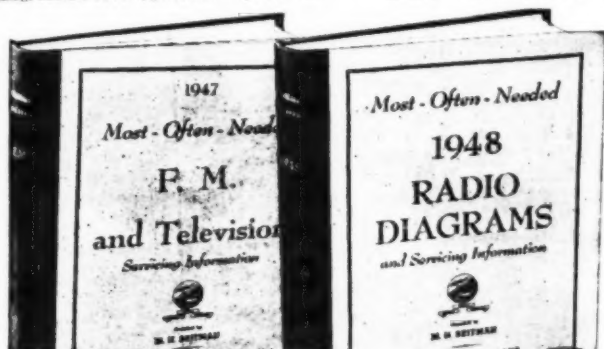
Compiled by M. N. Beltman, radio engineer, teacher, author & serviceman.

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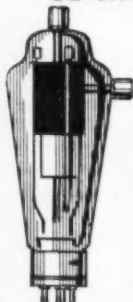


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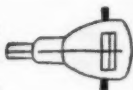
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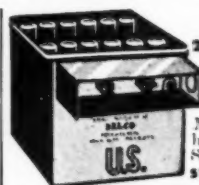
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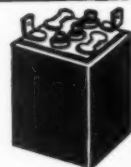
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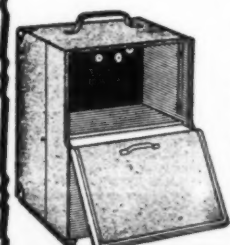
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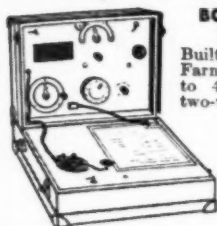
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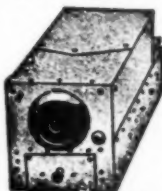
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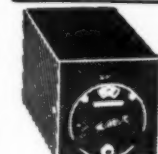
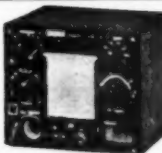
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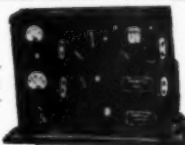
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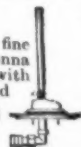
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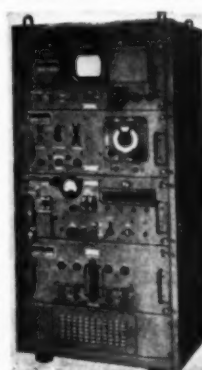


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MA-839 40-40 mfd. 150 WVDC

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MA-2530 600 VCT, 50 MA; 6.3V, 2A; 5V, 2A transformer (half-shell mtg.)... 2.09
MA-1290 15 henry, 50 MA, 120 ohm choke... .49
MA-1205 Universal output transformer for single p.p. or parallel tubes; rated 12 watts (strap mtg.)... 1.19
MA-2525 600 VCT, 100 MA; 6.3V, 3A; 5V, 3A transformer (upright mtg.)... 2.79

Volume Controls with Switches

39c each, 10 for \$3.49

MA-1141 100,000 ohm MA-1153 500,000 ohm
MA-1107 250,000 ohm MA-1105 2.5 megohm
MA-1134 350,000 ohm

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MA-2229 1 6", 1.68 oz. Alnico 5..... 1.69
MA-2267 8", 21 oz. Alnico 3..... 3.79
MA-2268 12", 21 oz. Alnico 3..... 6.50

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¾" clamp to fit 807, 2X2 and other popular tubes. Made by a famous manufacturer. Regular 21c. Get your share while they last at this sensational low price. MA-2234, 6 for 79c



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MID-AMERICA CO. Inc.

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Controlled Rectifier

(Continued from page 44)

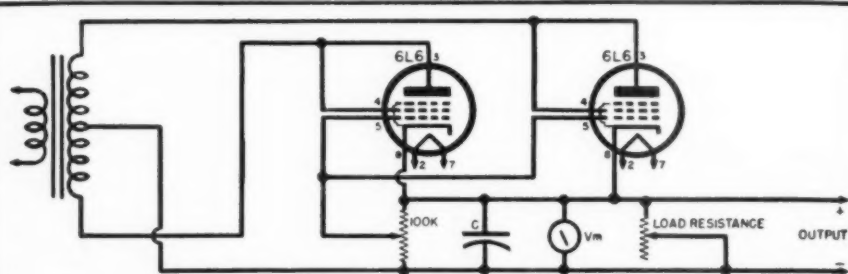
from those specified. Aside from the fact that the filter condensers should have voltage ratings suitable for the power transformer to be used, there is nothing critical about the values of the components used in this unit and the constructor can use junk box parts he happens to have on hand.

The unit illustrated features a controlled rectifier with variable output. The transformer ratio and the type of filter is entirely optional with the builder. The only critical item is the control potentiometer, shown in the schematic as a 100,000 ohm, wirewound *Clarostat* W-49 standard pot. This pot carries the full output voltage when it is advanced full-on. It should be either a 3 or 6 watt unit, depending upon the maximum output

voltage. For a low voltage unit of, say, 200 volts, an ordinary carbon pot may suffice. However, experience has shown that it is better not to use carbon pots in this particular application.

For those who have 1625's (an extremely inexpensive surplus tube) plus a power transformer with a 12 volt or two 6 volt windings, an inexpensive power supply can be built. Those with plenty of 6L6's on hand may use these tubes in preference to the 6AS7G specified in the circuit diagram.

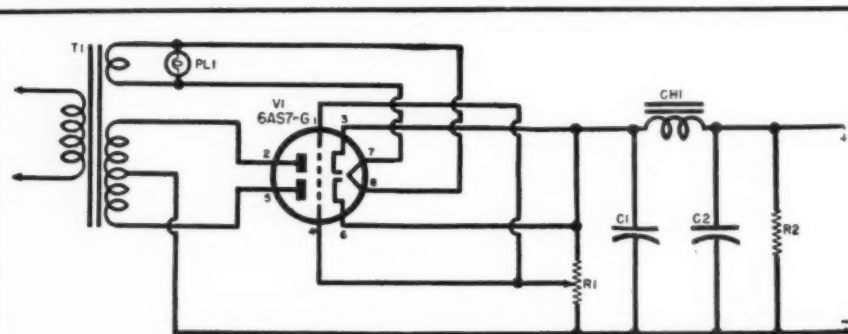
This controlled rectifier power supply features; simplicity and low cost, use of a single tube as both rectifier and control tube, smooth output control over a worthwhile range, no increase in ripple percentage as output voltage is lowered (typical of grid-phased thyatrons), no hash in output (typical of controlled rectifiers using gas tubes), and a certain measure of protection against overload due to the fairly high impedance of the rectifier



Tube	Range of D.C. Output Voltage	Range Ratio	Load Res.
6AS7G	145-396	2.7:1	14,200 ohm
	140-382	2.7:1	6300 ohm
	135-362	2.7:1	2350 ohm
	120-338	2.8:1	1450 ohm
Pair of 1625's	52-360	6.9:1	14,200 ohm
	49-321	6.6:1	6300 ohm
	45-293	6.5:1	2350 ohm
	43-263	6.1:1	1450 ohm
Pair of 6L6's	57-362	6.3:1	14,200 ohm
	52-325	6.3:1	6300 ohm
	48-266	5.6:1	2350 ohm
	45-230	5.1:1	1450 ohm

Fig. 2. Test data shows performance of various tubes that may be used in the design of the controlled rectifier. Diagram shown was the one used to obtain this data.

Fig. 3. Complete schematic diagram of controlled rectifier power supply.



R₁—100,000 ohm wirewound pot. (*Clarostat* W-49 or equivalent)
R₂—25,000 ohm, 15 w. wirewound res.
C₁, C₂—16 µfd., 450 v. elec. cond.

CH₁—16 hy., 150 ma. filter choke
T₁—Power trans. 325-0-325 v. @ 150 ma.; 6.3 v. @ 3 amps.
PL₁—Pilot lamp 1—6AS7G tube

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Direct to Vert. Amp. Input .1 v RMS
Direct to Hor. Amp. Input .14 v RMS

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Sine Wave frequency response: Plus or minus 2 db.
5 cycles to 5 mc. down 6 db. at 7 mc.
Gain Control: Independent of frequency within
range of the amplifier.
Phase shift: Less than 1° at 60 cycles (overall).
Square wave response: 30 cycles to 150 kc.

HORIZONTAL AMPLIFIER—

Sine Wave frequency response: Plus or minus 2 db.
5 cycles to 1.5 mc. down 6 db. at 2 mc.
Gain Control: Independent of frequency within
range of the amplifier.
Phase shift: Less than 1° at 60 cycles (overall).
Square wave response: 30 cycles to 50 kc.

Z AXIS AMPLIFIER—

Sine Wave frequency response: Plus or minus 2 db.
100 cycles to 100 kc. down 6 db. at 150 kc.

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November, 1948

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 AY31, 26 volts, 400 cycle. Shaft extends from both ends.
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 F16, Electric Indicator Company, two-phase, 22 V. per phase at 1800 R. P. M.
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 B-6B, Electric Indicator Company, Drag Cup, 110 volts, 60 cycle, one phase.
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A.C. MOTORS

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when operating at reduced output voltage.

It might be mentioned that the simplicity of the self-bias scheme does not permit an infinite control range. The extreme simplicity of the scheme does, however, make it worthwhile to build up this unit. It is entirely possible to provide a separate bias supply of suitable level to completely cut-off the controlled rectifier and thus obtain a supply adjustable from zero to full voltage. Such a supply would, unfortunately, cease to fall in the class of simple and inexpensive power supply units.

QUICK CHECK FOR SERIES FILAMENT TROUBLE

By HUGH LINEBACK
 Asst. Prof., Oklahoma A. & M.

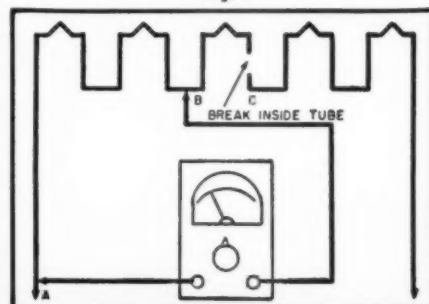
A SERIES filament circuit in a receiver is about the simplest hook-up in the set, but it often causes some of the most baffling troubles. For instance, in the case of the intermittent tube which tests good when cold, but opens the circuit when it warms up, it is difficult to locate the offending tube, as they all go dead at the same time. By the time an ohmmeter test is made the circuit will probably be closed again, and in any case a little judgment is required to interpret the readings as the filament resistance changes with different values of current. The following simple check with a multimeter is made with the receiver under operating conditions.

Set the meter to cover the total voltage applied across the filaments, noticing, of course, whether a.c. or d.c. is used. Connect one test lead to the first filament connection, as at point A shown in Fig. 1. Then move the other test prod successively down the line of filament pins. In the case shown there will be no voltage at any of the pins through the one marked B, but when pin C is touched, practically full voltage will be indicated. Thus it is quickly shown where the break has occurred.

The same procedure is useful when all tubes have continuity but the trouble is hidden in a bad joint or socket prong.

The theory behind this handy method will be remembered from Ohm's Law, which shows that no voltage will be lost across the tubes when there is no current flowing through the circuit. ($E = IR$). Therefore, since the meter current is negligible and there is no drop across the tubes, full voltage appears at the break. As soon as the trouble is corrected and normal current flows, the proper voltage will be lost across each tube.

Fig. 1



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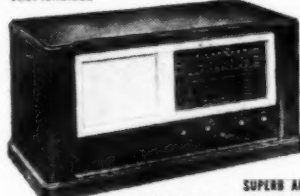


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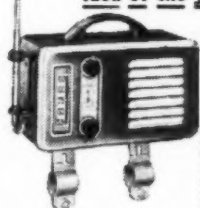
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100 ml 10H. **50c**

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2B07......69c	12A6......39	864......49	7193......39
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705A.....2.95	12J5......39	RK34......39	110 VAC Neon
726A.....14.95	12K8......69	35W4......39	Light......39
801A.....95c	12SR7......59	1625......39	Amperite 10T1......39
5BP4.....2.95	12AT6......49	1629......39	
	832A.....2.95	2051......39	

W.E. 700A Magnetron. 680-710 mc, 100 KWpk Pwr. Output. **\$24.95**

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Magnetron monocrystal, the simplest type, 6 trunks (loops). Each loop has a cord, a jack, a drop, and a 2-way lever key. Has built-in ringer and head and chest set for operator. Ringing from distant end of a loop operates the drop. Operator's phone is connected to loop by snapping key switch in one direction. Snapping the key in the other direction connects the hand generator to the loop. Establish connection between the two loops by connecting the cord of one to the jack of the other. Ideal for camps, motels, oil-field or timber operation, etc. Condition: used, good. Price is ridiculously low, only **\$12.95**

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The complete amplifier includes one rect. TY4, 3-12F7's for amplification and control, 3-7N7's for signal discrimination, 1 power transformer, 6 relays, 4 control pots, chokes, condensers, etc. Convert for use on radio controlled models, doors, etc. Operates from 24 V. DC. Size: 9 1/2 x 6 1/2 x 7 1/2". Complete. NOTE: Tubes good for television sets. Used—good condition. F.O.B. Chicago, \$4.95 only

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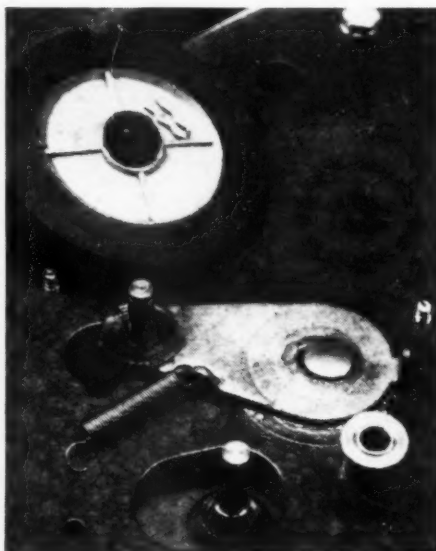
(Continued from page 39)

plate from the motor and clean all metal chips from the shaft, felt, and bearing. Upon reassembly of all the parts, the speed conversion is complete.

In order to return to 78 r.p.m., a motor pulley with a smaller-diameter shaft hole must be provided. If a lathe or services of a machinist are not available, a reasonably satisfactory bushing can be made for the old pulley from several turns of a 1/2-inch strip of heavy aluminum foil, such as may be obtained from a discarded electrolytic condenser. The hole must be perfectly concentric, or disagreeable flutter will be heard when playing records at 78 r.p.m.

The final step is the installation of the Microgroove pickup. Mounting dimensions of the particular pickup arm used, and the size of the player base must be considered when selecting the location. Fig. 1 shows a Shure Model 900MG pickup mounted on a Webster 56 changer. The position shown is the only one in which the pickup mounting hole could be located the specified distance from the turntable center, and still have no part of the pickup arm project beyond the edges of the player base. This particular pickup was intended to be used with the turntable surface a considerably greater distance above the mounting plate than that of the Webster. This results in improper tracking unless a stack of four or five records is placed on the turntable under the record being played. The extra weight of these records helps to stabilize the rotation speed and also permits the MG pickup to engage the beginning of a 12-inch record, otherwise prevented by interference of the crescent assembly at

Fig. 2. Detail view of drive parts showing idler wheel removed from shaft, enlarged hole in baseplate, reduced diameter motor shaft, and motor pulley with aluminum foil bushing. See text for details.



\$ \$ VALUES \$ \$

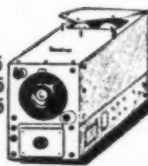
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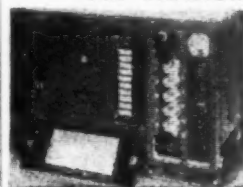


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BC454-3-6-MC...5.95
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6 1/2' CONTROL CABLE for Command Sets \$1.00 ea.



FM TRANSMITTER

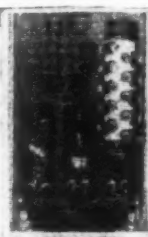


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For 10 and 11 meters. BC-603. 20 to 30 MC superhet. BFO, squelch; 10 push-buttons and manual tuning. Makes fine wide-band IF strip for 88-108 MC FM with converter. Includes 10 tubes, speaker, case and diagram. 12 volt good...\$9.95
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12V Dynamotor for above Trans...\$11.95
625V-225 A



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- 2—Plate Caps for 872A..... each .20
- 2—Sockets for 872A..... each 1.19
- 2—Hash Filter Chokes..... pr. .79

All Parts New! Reduced to **\$79.50**

SELENIUM RECTIFIERS

Full Wave Bridge Type

INPUT	OUTPUT		
up to 18v AC	up to 12v DC	1/2 Amp.	\$0.98
up to 18v AC	up to 12v DC	1 Amp.	1.95
up to 18v AC	up to 12v DC	3 Amp.	3.45
up to 18v AC	up to 12v DC	5 Amp.	4.45
up to 18v AC	up to 12v DC	10 Amp.	7.45
up to 18v AC	up to 12v DC	15 Amp.	9.95
up to 18v AC	up to 12v DC	30 Amp.	14.95
up to 36v AC	up to 28v DC	1 Amp.	3.45
up to 36v AC	up to 28v DC	5 Amp.	7.45
up to 36v AC	up to 28v DC	10 Amp.	12.45
up to 36v AC	up to 28v DC	15 Amp.	18.95
up to 115v AC	up to 100v DC	.25 Amp.	2.95
up to 115v AC	up to 100v DC	6 Amp.	6.95
up to 115v AC	up to 100v DC	5 Amp.	19.95
up to 115v AC	up to 100v DC	3 Amp.	12.95

OIL CONDENSERS

NATIONALLY ADVERTISED BRANDS
All Ratings D. C.

2x1mfd. 600v	\$0.35	1mfd. 2000v	\$0.95
.25mfd. 600v	.35	2mfd. 2000v	1.75
.5mfd. 600v	.35	4mfd. 2000v	3.75
1mfd. 600v	.35	15mfd. 2000v	4.95
2mfd. 600v	.35	4mfd. 2500v	3.98
4mfd. 600v	.60	2mfd. 2500v	2.49
8mfd. 600v	1.10	1mfd. 2500v	1.25
10mfd. 600v	1.15	.25mfd. 2500v	1.45
3x1mfd. 1000v	.45	.5mfd. 2500v	1.75
.25mfd. 1000v	.45	.05mfd. 3000v	1.95
1mfd. 1000v	.60	1mfd. 3000v	2.25
2mfd. 1000v	.70	.25mfd. 3000v	2.65
4mfd. 1000v	.90	1mfd. 3000v	3.50
8mfd. 1000v	1.95	12mfd. 3000v	6.95
10mfd. 1000v	2.10	2mfd. 4000v	5.95
15mfd. 1000v	2.25	1mfd. 5000v	4.95
20mfd. 1000v	2.95	1mfd. 7000v	2.95
24mfd. 1500v	6.95	3mfd. 4000v	6.95
1mfd. 1750v	.89	2mfd. 5000v	3.45
1mfd. 2000v	.95	2x1mfd. 7000v	3.25
.25mfd. 2000v	1.05	.02mfd. 12000v	9.95
.5mfd. 2000v	1.15	.02mfd. 20000v	11.95

HIGH CAPACITY CONDENSERS

10,000 mfd.—25 WVDC	\$6.95
2x3500 mfd.—25 WVDC	3.45
2500 mfd.—3 VDC	.39
3000 mfd.—25 WVDC	2.49
2x1250 mfd.—15 VDC	1.25
1000 mfd.—10 WVDC	.99
200 mfd.—35 VDC	.59
100 mfd.—50 WVDC	.49
4x100 mfd.—400 VDC	.89
4000 mfd.—18 WVDC	1.95
4000 mfd.—25 WVDC	2.95
4000 mfd.—30 WVDC	3.25

FILTER CHOKES

HI-VOLTAGE INSULATION

8 by @ 550 ma.	\$7.95	325 by @ 3 ma.	\$3.45
8 by @ 300 ma.	3.95	1 by @ 800 ma.	14.99
25 by @ 160 ma.	3.49	10 by @ 250 ma.	2.45
12 by @ 050 ma.	2.25	10 by @ 200 ma.	1.98
30 by @ 70 ma.	1.39	10 by @ 85 ma.	1.59
.05 by @ 15 amps.	7.95	15 by @ 125 ma.	1.49
.1 by @ 5 amps.	6.95	15 by @ 100 ma.	1.39
.4 by @ 600 ma.	5.95	3 by @ 50 ma.	.29
200 by @ 10 ma.	2.49	30 by Dual @ 20 ma.	1.49
600 by @ 3 ma.	3.49	8/30 by @ 250 ma.	3.50
.065 by @ 2.5A	2.49	10 by @ 100 ma.	1.29

RADIO TUBES

NEW!—STANDARD BRANDS!

1B24.....	\$22.95	800.....	\$1.69	1Q5GT.....	\$0.99
1B26.....	4.95	801A.....	.49	1R5.....	.79
1B29.....	.89	802.....	2.95	1R4.....	.69
1N21.....	.59	803.....	5.95	1R5.....	.59
1N23.....	.59	805.....	3.95	1T4.....	.59
1N34.....	1.60	807.....	1.19	3Q4.....	.59
1P24.....	.89	808.....	2.25	3Q5.....	.69
2AP1.....	2.95	809.....	1.98	3R4.....	.59
2C22.....	.29	810.....	6.25	5Y4GT.....	.55
2C26.....	.29	811.....	1.49	6A7.....	.59
2C40.....	.89	812.....	1.98	6ASGT.....	.59
2C44.....	1.39	813.....	5.25	6AG5.....	.79
2C46.....	4.95	814.....	3.49	6AG7.....	.98
2D21.....	1.59	815.....	1.75	6B4G.....	.95
2J21.....	12.95	816.....	1.19	6B6G.....	1.49
2J22.....	12.95	826.....	.49	6C6.....	.49
2J26.....	12.95	829B.....	4.95	6D6.....	.49
2J31.....	14.95	832A.....	3.45	6F5GT.....	.52
2J32.....	18.95	833A.....	29.50	6F6GT.....	.49
2J36.....	24.95	836.....	1.49	6F6.....	.59
2J37.....	18.95	837.....	1.49	6H6GT.....	.39
2J38.....	18.95	838.....	2.95	6J5GT.....	.42
2J39.....	18.95	841.....	.49	6J5.....	.55
2J40.....	18.95	843.....	.39	6J7GT.....	.55
2J46.....	18.95	845.....	3.49	6K6GT.....	.49
2J49.....	34.95	851.....	17.95	6K7GT.....	.49
2J51.....	69.50	860.....	1.98	6L6G.....	.95
2J54B.....	18.95	861.....	14.95	6L6.....	1.29
2J55.....	18.95	865.....	.79	6L7.....	.79
2K25.....	24.95	866A.....	.85	6Q7GT.....	.55
2K28.....	14.95	866JR.....	1.10	6SA7GT.....	.49
2V3G.....	.98	869B.....	29.95	6SC7GT.....	.55
2X2.....	.59	874.....	.69	6SF5GT.....	.39
3AP1.....	2.95	878.....	.39	6SH7.....	.79
3BP1.....	2.49	878.....	1.98	6SJ7GT.....	.49
3B22.....	.59	884.....	.79	6SK7GT.....	.49
3B24.....	.59	885.....	.79	6SL7GT.....	.69
3B26.....	1.95	902P1.....	4.95	6SN7GT.....	.59
3CP1.....	2.95	905.....	.49	6SQ7GT.....	.49
3C22.....	19.95	923.....	.89	6V6GT.....	.59
3C23.....	2.49	954.....	.35	6X5GT.....	.59
3C24.....	.59	955.....	.35	7A8GT.....	.69
3C30.....	.59	956.....	.45	7B7GT.....	.59
3C4.....	1.49	957.....	.35	7C6.....	.59
3DP1.....	2.49	958.....	.35	7C7.....	.59
3D21A.....	2.95	1611.....	.98	7F7.....	.49
3E29.....	3.49	1613.....	.75	7Y4.....	.49
4B24.....	2.25	1616.....	.98	12ASGT.....	.63
4E27.....	12.95	1619.....	.29	12AT6.....	.49
5AP4.....	4.95	1622.....	1.59	12C7GT.....	.59
5BP1.....	1.98	1624.....	.98	12BA6.....	.59
5BP4.....	4.95	1625.....	.49	12BE6.....	.59
5CP1.....	3.95	1626.....	.25	12J5GT.....	.49
5D21.....	18.95	1629.....	.25	12J7GT.....	.49
5EP7.....	1.49	1630.....	3.50	12K7GT.....	.49
5JP1.....	11.95	1638.....	.79	12Q7GT.....	.59
5J29.....	18.95	1654.....	1.98	12SA7GT.....	.49
5J30.....	18.95	1851.....	.89	12SF5GT.....	.49
5LP1.....	11.95	2050.....	.75	12SF7GT.....	.59
5K4GY.....	.89	2051.....	.75	12SJ7GT.....	.49
5T4.....	.98	8005.....	2.95	12SK7GT.....	.49
5U4G.....	.49	8011.....	.69	12SR7GT.....	.49
5V4.....	.75	8012.....	1.98	12SR7GT.....	.49
5X4.....	.59	8013.....	2.69	14A7.....	.69
5Y3.....	.35	8014.....	6.95	14B6.....	.69
5Z3.....	.55	8016.....	1.89	14Q7.....	.69
5Z4.....	1.79	8020.....	2.95	20 SP5.....	.49
6AB7.....	1.05	8025.....	4.89	25L6GT.....	.49
6AC7.....	.59	9001.....	.39	25Z5.....	.47
6AK5.....	.89	9002.....	.39	25Z6GT.....	.45
6AL5.....	.69	9003.....	.39	26.....	.49
6CA.....	.25	9004.....	.39	27.....	.49
6BD4.....	1.49	9005.....	.39	30 SP5.....	.49
6J4.....	3.95	9006.....	.39	32L7GT.....	1.19
6J6.....	.89	CK1005.....	.29	35/51.....	.59
6Q5G.....	1.25	CK1006.....	.69	35A5.....	.59
7EP4.....	17.95	CK1090.....	1.49	35L6GT.....	.49
10Y.....	.39	EF50.....	.35	35V4.....	.38
12A6.....	.25	F123A.....	12.95	35Y4.....	.49
12DP7.....	14.95	F127A.....	17.50	35Z3.....	.57
12GP7.....	14.95	F128A.....	69.50	35Z5GT.....	.39
15E.....	.89	F660.....	39.50	36.....	.79
16R.....	.89	FG81A.....	4.95	41.....	.52
75TL.....	3.49	FG105.....	7.95	42.....	.49
100TH.....	9.95	FG23B.....	39.50	43.....	.52
211.....	.75	GL146.....	10.95	45.....	.52
227A.....	3.95	GL605.....	39.50	45 spec.....	.39
231D.....	1.49	GL697.....	29.50	47.....	.74
249C.....	1.75	HY615.....	1.25	50A5.....	.89
250TH.....	19.50	HY615.....	.49	50B5.....	.59
304TL.....	1.49	ML100.....	29.50	50L6GT.....	.49
304TH.....	6.95	ML101.....	39.50	50V6GT.....	.59
316A.....	.69	ML502.....	99.50	56.....	.54
327A.....	4.95	VR75.....	.89	59.....	.95
350B.....	1.95	VR90.....	.69	70L7GT.....	1.29
368AS.....	2.95	VR105.....	.69	71A.....	.59
371B.....	1.49	VR150.....	.69	75.....	.52
450TH.....	29.95	VT127A.....	2.49	76.....	.49
527.....	8.95	VU111.....	.49	77.....	.49
531.....	4.95	OZ4.....	.59	78.....	.49
559.....	1.29	1A5GT.....	.49	79.....	.85
703A.....	2.95	1A7GT.....	.59	80.....	.35
705A/8021.....	1.95	1H5GT.....	.54	82.....	1.55
706CY.....	18.95	1N5GT.....	.59	82.....	.89
714AY.....	6.95	1LA4.....	.95	83.....	.89
715B.....	8.95	1LA6.....	.95	83V.....	.89
715C.....	18.95	1LB4.....	.95	84.....	.59
717A.....	1.89	1LC6.....	.95	89.....	.69
721A.....	.59	1LD5.....	.95	117L7GT.....	1.15
723A/B.....	5.95	1LE3.....	.95	117P7GT.....	1.15
724A/B.....	1.95	1LH4.....	.79	117Z3.....	.49
725A/B.....	7.45	1LN5.....	.79	117Z6GT.....	.69
726A.....	6.95				

500 WATT POWER SUPPLY KIT

(Ideal for BC-191 and BC-375E)

1—TRANSFORMER\$32.50

Pri 105/250v-60 cyc in 5v steps

Secs 1120-0-1120 @ 500 ma.

2.5v CT @ 10 amps.

12v CT @ 14 amps.

17v CT @ 2.5 amps.

32v CT @ .025 amps.

2—FILTER CHOKES.....\$15.90

2—2 mfd. 2000v CONDENSERS... 3.50

2—Type 866 TUBES..... 1.78

2—PLATE CAPS..... .40

2—SOCKETS..... .40

1—PR. HASH FILTER CHOKES79

PER EACH—AS ABOVE **\$49.50**

COMPLETE

TRANSFORMER—115 V. 60 Cy.

HI-VOLTAGE INSULATION

3710v @ 10 ma.; 2x2 1/2v @ 3A.....	\$ 9.95
2500v @ 15 ma.....	6.50
2500v @ 4 ma.; 2 1/2v 2A. 6.3v @ 1 amp.....	7.95
2150v @ 15 ma.....	5.50
1750v @ 4 ma.; 6.3v @ 3A.....	6.50
1600v @ 4 ma.; 700v CT @ 150 ma.; 6.3v @ 9A.....	7.95
525-0-525v @ 60 ma.; 925v @ 10 ma.; 2x5v @ 3A; 6.3v @ 3.6A; 6.3v @ 2A; 6.3v @ 1A.....	7.95
515-0-515v @ 175 ma.; 5v @ 3A; 2.5v @ 5A.....	5.95
500-0-500v @ 25 ma.; 262-0-262v @ 55 ma.; 6.3v @ 1A; 2x5v @ 2A.....	4.49
500-0-500v @ 100 ma.; 5v CT @ 3A.....	4.95
450-0-450 @ 200 ma.; 315 @ 10 ma.; 6.3v @ 7A; 5v @ 3A; 5v @ 2A; 110/220v Pri.....	10.95
450-0-425 @ 200 ma.; 150-0-150 @ 100 ma.; 4v @ 1A; 6.3v @ 5A; 5v @ 3A; 110/220v Pri. tapped.....	7.50
400-315-0-100-315v @ 200 ma.; 2.5v @ 2A; 5v @ 3A; 6.3v @ 9A; 6.3v @ 9A.....	6.50
400-0-400v @ 200 ma.; 5v @ 3A.....	4.95
350-0-350v @ 150 ma.; 5v @ 3A; 6.3v @ 6A; 78v @ 1A.....	4.95
385-0-385-550v @ 200 ma.; 2 1/2v @ 2A; 5v @ 3A; 3x6.3v @ 6A—PRI. 110/220.....	7.95
350-0-350v @ 150 ma.; 5v @ 3A; 6.3v @ 7.5A; 6.3v @ 3A.....	4.95
350-0-350v @ 35 ma.....	1.95
340-0-340v @ 300 ma.; 1540v @ 5 ma.....	5.49
335-0-335v @ 60 ma.; 5v @ 3A; 6.3v @ 2A; 0-13-17-21-23v @ 70 ma.—PRI. 110/220.....	4.95
325-0-325v @ 120 ma.; 10v @ 5A; 5v @ 7A.....	3.49
300-0-300v @ 65 ma.; 2x5v @ 2A; 6.3v @ 2 1/2A; 6.3v @ 1A.....	3.49
250-0-250v @ 100 ma.; 2x6.3v @ 4A; 6.3v @ 5A; 6.3v @ 1A.....	4.95
150-0-150 @ 80 ma.; 150 @ 40 ma.; 6.3v @ 3.5A; 6.3v @ 1A.....	1.95
150v @ 55A; 150v @ 2.13A; 5v @ 5A.....	5.95
120-0-120v @ 50 ma.....	.95
80-0-80v @ 225 ma.; 6.3v @ 2A; 5v @ 4A.....	3.95
24v @ 6A.....	3.50
3x18v @ 2A.....	3.50
13.5v CT @ 3.25A.....	2.95
3x10.3v @ 7A; CT.....	9.95
12.6v CT @ 10A; 11v CT @ 6.5A.....	7.95
3x6.3v @ 1A; 2x6.3v @ 2A; 10v CT @ 10A; 12.6v CT @ 1A.....	4.95
6.3v @ 12A; 6.3v @ 2A; 115v @ 1A.....	3.95
6.3v @ 10A; 6.3v @ 1A.....	3.50
6.3v @ 1A; 2 1/2v @ 2A.....	3.50
5v @ 20A; Dual 110v PRI.....	3.49
6.3v @ 21 1/2A; 6.3v @ 2A; 2 1/2v @ 2A.....	5.49
5v—190A..... \$17.50.....	6.3v @ 1A.....
5v—115A..... 14.95.....	8v CT 1A.....
2.5v @ 20A..... 3.49.....	.6v @ 15ARMS.....
6.3v CT @ 3A; 5v CT @ 4A.....	2.95

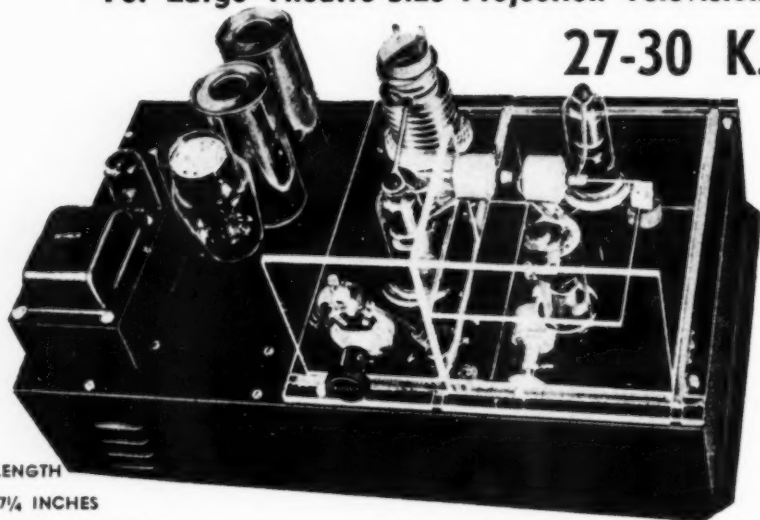
TELEVISION INDUSTRIES

Specially Designed

R.F. POWER SUPPLY

For Large Theatre-Size Projection Television

27-30 K.V.



LENGTH

17 1/4 INCHES

WIDTH—10 1/2 INCHES

HEIGHT—11 1/2 INCHES

FEATURES

Theatre Size Projection Television up to 10 ft. diagonal. Housed in attractive Brown baked enamel case with the low and high voltage built on one chassis. Safely rated at 20 to 40 K.V. at 100 microamperes and uses 3—1B3, 2—6Y6 and 1—5U4. A Frequency Control Padder increases maximum output and removes any R.F. which might appear in picture. Unconditionally Guaranteed.

Complete with tubes, cover and 4 ft. heavy coaxial cable lead.

\$135.00

DEALERS NET

SEE YOUR LOCAL

NATIONAL PARTS DISTRIBUTOR

TELEVISION INDUSTRIES Co.

540 BUSHWICK AVE.
BROOKLYN 6, N. Y.

WANTED—Western Electric Carrier Telephone and Telegraph Equipment and Components. Filters, repeating coils, transformers, equalizers. Types CF1, CF2, H, C, and other carrier equipment. Telephone and telegraph repeaters.

Box 450, Radio & Television News,
185 N. Wabash, Chicago, Illinois

L. I. SPECIALS

BC732 Control Head.....	\$0.89
274N R/ Angle Drive.....	.75
274N 2-Transmitter Rack.....	.89
Mounting for above.....	.85
6-Contact Plug for Loran.....	1.25
BC375 Cable w/ PL61 Plugs.....	1.95
274M Tuning Cable 45'.....	.65
MN26 Tuning Cable 100'.....	1.95
MC203 "T" Coupling.....	1.50
MN26 R/ Angle Drive.....	2.35
Mounting for ARN7.....	1.50
BC348 Plug.....	.59
DM21M Dynamotor, 12-V. input.....	1.95
I-B2A Indicator (exp. pkd.).....	6.50
Set of 4 plugs for ARN7.....	4.65
10 w 470 ohm "Koolohm" per c.....	2.95

Equipment new—FOB Flushing, N. Y.

LONG ISLAND RADIO CO.
164-21 Northern Blvd., Flushing, N. Y.

the back of the changer base. Other makes of pickups will probably require slightly different mounting and operating procedures. When selecting the pickup location, be sure that it does not interfere with dropping of records by the changer mechanism when the machine is used in that manner.

The conversion is now complete. A single-pole, double-throw switch may be installed, if desired, to switch either pickup to the amplifier input. To change the mechanism from 78 to 33 1/3 r.p.m., remove the turntable, loosen the setscrew in the motor pulley, and remove it from the shaft. Then replace the turntable. Play the Microgroove records with the changer selector switch in "Manual" position.

—30—

Sell Your Service

(Continued from page 49)

tering the shop has much to do with his acceptance or rejection of your service in the future. For this reason, the time spent on designing or arranging shop fixtures and displays should not be considered as lost. Displays, radio sets, and accessories should be arranged so that they present an effective sales argument the moment the customer walks in the shop. This form of silent selling, which depends mainly on "eye appeal" as the means of telling its story, should never be neglected. This especially applies to window displays, which play a vital part in attracting new customers and drawing them into the shop.

In arranging window displays, put yourself in the place of a passerby. There are a dozen stores on your street—if you had no personal or special interest in any of them, what would cause you to stop? What type of window decoration or display would attract your attention or appeal to your curiosity?

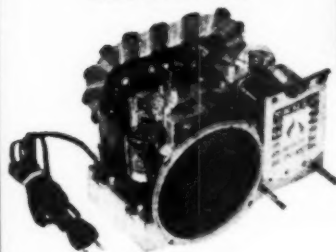
Keep all displays simple and to the point; avoid overdressing or filling the windows too full of merchandise. Over-crowding creates confusion and often detracts instead of attracting. It is a good idea to change the window occasionally, decorating and using appropriate motifs on holidays, seasons, and other special occasions.

Fluorescent lighting, especially in the shop and on the sales floor, helps give the shop a clean, light appearance, and relieves eye-strain not only for your customers, but for you and your servicemen. At the same time, the reduction in electric bills will pay for the fluorescent fixtures within a comparatively short time.

Personal appearance may be improved by wearing an inexpensive service tunic or uniform whenever at the service bench. These items give a more professional appearance to the shop and may be obtained quite reasonably from at least one service organization.

RADIO & TELEVISION NEWS

CORONET 5 Tube Superheterodyne Receiver Kit



This kit combines an excellent educational program with many hours of building and listening pleasure; particular stress being placed upon ease of construction. Easy step by step instructions are furnished, along with pictorial diagrams and voltage and resistance charts for efficient maintenance and further experimentation. Many circuit features employed by big name manufacturers are employed to make this set, when completed, comparable to any 5 Tube AC-DC Radio now on the market.



● Complete with plastic cabinet and carrying handle.

- 117V, AC-DC operated. Power supply rated at 30W.
- Tube Lineup—12SA7, 12SK7, 12SQ7, 35Z5, 50L6.
- Tuning range—540-1700 KC. Designed for fullest selectivity along entire band.
- Built-in loop antenna.
- All parts engineered to fit; no additional cutting or drilling to do.
- Nothing else to buy except solder. Kit packed complete including tubes.

LIST PRICE **\$11.95**

Dealers, educational institutions, write for quantity discounts.

IRVING JOSEPH

WHERE PRICE IS AN OBJECT AND QUALITY IS UNDERSTOOD - EVERY ITEM WE SHIP IS BACKED UP BY AN UNCONDITIONAL GUARANTEE.

FILTER CONDENSERS

Supplies limited. There's no more where these came from. Each condenser fully guaranteed.

- 50 Mfd, 25V. Mfg. by C-D. $\frac{1}{8}$ " Dia. x $1\frac{1}{2}$ "..... 10 for **\$1.45**
- 4 Mfd, 450V. Mfg. by C-D. $\frac{1}{8}$ " Dia. x $1\frac{1}{2}$ "..... 10 for **\$2.10**
- B-B, 450V—8, 350V—50, 50V. Mfg. by C-D. $1\frac{1}{4}$ " Dia. x $3\frac{1}{4}$ " with mounting strap. 59¢ each..... 10 for **\$5.20**

NOVEMBER CONDENSER SPECIAL

40-20, 150V. Wax impreg. paper filter. Mfg. by Industrial. $1\frac{1}{2}$ " Dia. x 3". Guaranteed perfect. 29¢ each. 10 for **\$2.60**. 100 for **\$23.50**

WAFER SWITCH

4 Gang, 1 Pole each gang, 12 position. Wafers easily removed for many additional switching requirements. Measures $3\frac{1}{4}$ " overall length x $1\frac{1}{8}$ " overall diameter. $\frac{1}{4}$ " Dia. Shaft $\frac{1}{2}$ ". 75¢ each. 10 for **\$5.80**

WAFER SWITCH

Single wafer. 3 Pole 2 Pos. Very versatile. Can be used as SPST, SPDT, DPST, DPDT, 3P2T. $1\frac{1}{4}$ " overall length x $1\frac{1}{8}$ " overall dia. $\frac{1}{4}$ " Dia. Shaft x $\frac{1}{2}$ ". 10 for **\$2.10**

Special Purchases!!

SOCKETS

- 7 Prong Miniature. Wafer type. $\frac{3}{8}$ " mtg. center. 10 for **65¢**..... 100 for **\$5.25**
- 7 Prong Miniature. Molded bakelite. With locking ring. 10 for **80¢**..... 100 for **\$6.75**
- 4 Prong. Black molded Bakelite. With locking ring. 10 for **60¢**..... 100 for **\$5.25**
- 5 Prong. Saddle Mount. $1\frac{1}{2}$ " mtg. center. Brown bakelite. 10 for **60¢**..... 100 for **\$5.25**
- 6 Prong Black Molded Bakelite with locking ring. 10 for **60¢**..... 100 for **\$5.25**
- 8 Prong Octal. Saddle mount. $1\frac{1}{2}$ " mtg. center. 10 for **60¢**..... 100 for **\$5.25**
- Octal Socket. Amphenol. $1\frac{1}{2}$ " mounting center. 10 for **60¢** 100 for **\$4.00** 1000 for **\$32.50**

PAPER CONDENSER ASSORTMENT

100 assorted paper tubular and molded paper by-pass condensers. Wide assortment of standard capacities at 150V, 200V, 400V and 600V. Every condenser guaranteed. Kit at 100..... **\$3.85**

RESISTOR ASSORTMENT

100 insulated carbon and wire wound resistors. Standard color coded. Wide assortment of useful sizes, $\frac{1}{8}$, $\frac{1}{4}$, 1, 2, 5, 10, and 20 W. 100 Assorted..... **\$1.95**

COAXIAL CABLE

RG8/U—52 Ohm. Amphenol. **\$2.85** per 100' **\$25.00** per 1000'.

RELAYS

110V AC SPST..... **\$1.00**
110V AC DPDT..... **1.50**

SLIDE SWITCH

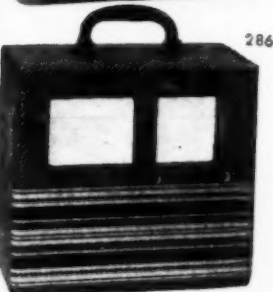
Choice of SPDT or DPDT..... 8 for **\$1.00**

GENERAL PURPOSE HOOK-UP WIRE

	Per C	Per M
*No. 12 Stranded.....	\$1.15	\$9.00
*No. 16 Stranded.....	.95	7.50
*No. 18 Choice of Solid or Stranded.....	.75	6.50
*No. 20 Choice of Solid or Stranded.....	.65	5.50
†No. 22 Choice of Solid or Stranded.....	.55	3.75
†No. 24 Solid.....	.45	3.50

*Available with spun-glass or cotton insulation.
†Available with spun-glass or plastic insulation.
Please state first and second choice of colors or colored tracer.

RADIO CABINETS



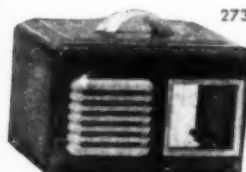
BELOW MANUFACTURERS COST

No. 261. Leatherette covered. $12 \times 11\frac{1}{2} \times 7\frac{1}{2}$ ". Cutout as shown. Plastic handle. With grill and dial glass **\$1.95**

No. 286. Leatherette covered. $9\frac{1}{2} \times 12\frac{1}{2} \times 5$ ". Leather handle. White—brown trim. Cutout as shown. **\$1.50**

No. 285. Same as above. Brown and Tan..... **\$1.50**

No. 273. Plastic. Choice of black or ivory with contrasting trim as shown. Cutout as shown. $10\frac{1}{2} \times 6 \times 6\frac{3}{4}$ " overall dimensions. **\$1.50**



Jobbers, manufacturers, quantity buyers of any standard receiver components, inquiries invited. Prompt quotations upon request.

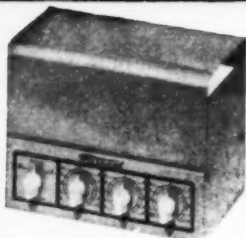
TERMS: All items subject to prior sale. Prices subject to change without notice. A 25% deposit required on all C.O.D. orders. All shipments made F.O.B. Chicago, Illinois.

IRVING JOSEPH

215 S. Halsted St.,
Chicago 6, Ill.

All Mail Orders Shipped Promptly!

SAVE ON THESE MONEY-SAVING VALUES!



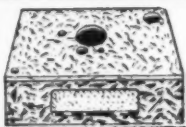
The HF 10 amplifier is a general purpose unit of small size (6"x9"x7") designed for high quality reproduction of sound, music and speech from records, radio and microphone. It is engineered and built to meet the high quality standards required of an amplifier when used in conjunction with the new high fidelity pickups, FM-AM tuners and wide range speaker systems.



**METAL CAN AEROVOX
REPLACEMENT FILTER
CONDENSERS**

Replaces 8x8 at 600 working volts. DC test volt 800.

Each..... **\$1.29**
10 for..... **\$11.75**



RECORD PLAYER CASE KITS

Kit consists of 6 cabinets similar to above for phono players, changers, etc.

6 for..... **\$3.00**

**ALL NEW, FULLY GUARANTEED
STANDARD BRAND TUBES**

832A.....	\$1.98
826.....	.49
827A.....	1.95
9001.....	.75
9003.....	.75
2D21 Thyratron.....	.75
2X2.....	.69

HF 10 TRUSOUND AMPLIFIER

FEATURES

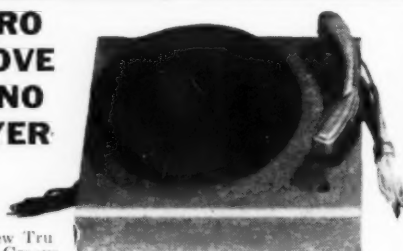
- 10 watts undistorted power output 18 watts peak.
- Inputs: High Gain for variable reluctance pickups; for high impedance mikes. Low Gain for FM-AM tuners and high output pickups.
- Selector switch for rapid changeover.
- Hum level 70 db below 12 watts.
- Tone compensation. Separate continuously variable base and treble controls.
- Treble—from plus 10 db to minus 15 db at 10,000 cps.
- Bass—from plus 10 db to minus 15 db at 50 cps.
- Note—flat characteristics obtained with controls centered.
- Output impedance 2, 4, 8, 16 and 500 ohms.
- Straight AC for 110-120/50-60 cycles fused.
- Tubes—6SL7, 6SC7, 2—6V6, 5Y3.
- Chassis and shield silver gray hammeroid finish.
- Hermetically sealed components used throughout.

Complete with

Tubes and Cover.....

\$29.95

**MICRO
GROOVE
PHONO
PLAYER**



At last a new Tru sound Micro Groove record player. Proven in hundreds of broadcasting stations throughout the U. S. The Radio Shack offers this remarkable advancement in high fidelity musical reproduction of the new LP Micro Groove Records. The Trusound Micro Groove Record Player uses the new SHURE Featherweight arm and cartridge; overall wt. 8 grams. Prolongs life of the fine micro groove recordings. The 33 1/3 RPM constant speed motor is smooth and quiet in operation assuring no WOWS or rumbles to interfere with your listening pleasure.

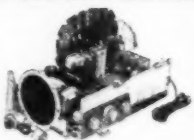
List Price \$24.95. Your Cost..... **\$16.50**
In Lots of 1-3. 4 or More..... **\$13.95**

**7-Tube Superhet. AC-DC Radio-
Phono Combination Chassis**

Complete with 7A8, 7B7, 2—7C6, 2—35L6, 35Z5 Tubes, 6-inch PM Speaker. Completely wired.

Each..... **\$16.50**

Limited Quantity



Write for our new **FREE 1949 Catalog**

TERMS: Minimum order \$3.00. 25% deposit. Bal. C.O.D., F.O.B. Chicago

Mort's Radio Shack

630 W. RANDOLPH STREET

CHICAGO 6, ILL.

**LEARN CODE FASTER
with Ingenious Code Tutor**

The Precision Transmitting Machine

Now! Learn by ear automatically. Listen to code characters sounded precisely at any speed you desire—on the clear Tone-Buzzer of the CODE TUTOR mechanical transmitter. Then, repeat back and duplicate each character's sound on Practice Key. In no time, develop transmitting perfection that will amaze you.

EXCELLENT FOR CLASS WORK

Get your CODE TUTOR today from your dealer or factory direct. **SPECIAL** low introductory price—only \$7.95, complete. Two sets, for communication practice, only \$14.95, postpaid. Also Free details on many interesting uses for CODE TUTOR. Write NOW!

INTERNATIONAL ELECTRIC CO.
1836 W. North Ave., Chicago 22, Ill.

NEW

**INSIDE DOPE
ON**

IDEAL AMPLIFICATION

SEND 3c STAMP FOR POSTAGE

AMPLIFIER CORP. of AMERICA

398-2 BROADWAY, NEW YORK 13, NEW YORK

**"RADIO SERVICE STANDARD
RATE BOOK"**

ONLY \$1.00

At Parts Jobbers Everywhere

Write for Circular RN

OELRICH PUBLICATIONS

4135 N. Lawler Avenue • Chicago 41, Ill.

The effect of a neat, modern, professional-looking service bench on customer-confidence cannot be over-emphasized. A neat, logical arrangement of test equipment also aids considerably in increasing servicing efficiency and ease of operation.

Dependability is an acquired art. If a set is promised at a specific time, be sure it is ready. If unforeseen difficulties arise and the job cannot be completed on schedule, lend the customer an "extra" set until his is ready. Many times this will result in an extra sale, in addition to creating added good-will.

The customer will also remember those "little things" such as plugging the set in for a minute or two to re-check (and to allow him to listen to its improved operation), wiping fingerprints (imaginary or otherwise) from the cabinet, tightening the dial and drive cable, straightening the pointer, etc. He will be duly impressed by the fact that you took a "personal" interest in his set, whether he shows it or not. If he asks what was wrong with the set, answer his questions as simply and as straightforwardly as possible. In most cases he is idly curious—he won't understand your explanations but he appreciates them anyway. If your answers sound evasive or too technical, the customer immediately gets the impression that you're trying to "cover up" unnecessary repairs or charges. The use of itemized repair bills or invoices helps in establishing customer confidence. Don't forget stickers, calling cards, service guarantees, etc. as extra aids in promoting a feeling of position, efficiency, and business ethics.

While conversing with the new customer, study his face or features and associate them with his name. Remembering names and faces is another habit which can be acquired and developed. It is surprising how much it can be developed in a comparatively short time. If the customer makes personal mention of himself, his family, car, etc., jot these down on his repair card (after he leaves). On his next visit it is an easy matter to "look in the files" and casually ask questions about his car, that new baby, etc. Such trivial things are important to him, and they go a long way toward molding new friendships and increasing business contacts.

On outside calls, be sure to leave your business card. Ask the housewife to refer you to her friends whenever they need a serviceman. In many cases she knows of at least several friends who need some immediate radio service, or who perhaps are in the market for a new set. Don't forget to ask about other sets in the house when you make a delivery—these often add considerably to shop income. If you do appliance servicing, mention this fact—every home has one or more appliances which are not in order.

Keep your advertising up-to-date. Here are a few of the ways advertising can be effectively employed: (1)

run ads regularly in your local newspapers, (2) run short spots on the local station (if possible), (3) send postcard ads regularly to established and new customers, (4) supply book matches, blotters, pencils, key chains, etc. to cafes, business houses, and other establishments, (5) use the telephone to solicit new and repeat business, (6) employ a mailing list and keep it up-to-date, (7) follow social events in the papers and offer to rent sets, phonographs, or sound equipment for dances, weddings, and special occasions, (8) send envelope stuffers and special announcements with your statements, (9) put up eye-catching signs at strategic spots along the highways where allowed, and (10) adopt a short, "catchy" service motto; use it on your bills, stationery, business cards, service truck, telephone ads, etc.

Extra advertising for your shop can be accumulated by visiting and speaking before the local Rotary Club, Lions Club, Chamber of Commerce meetings, etc. Join civic associations and projects and take an active part in their affairs. At first, the points just mentioned may appear to take up too much of your time. By careful planning and arranging, however, you will be able to accomplish a good deal more than you think. A serviceman who keeps up with the affairs and accomplishments of the community is in a better position to share in its dividends. Concentrate on really selling your service, and your list of satisfied customers will take care of itself.

-30-

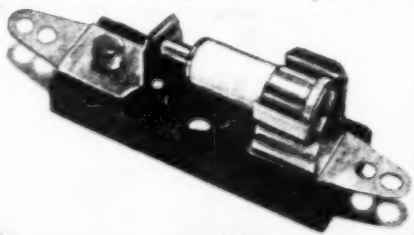
CRYSTAL DIODE CLIP

THE 1N21B crystal diode is similar electrically to the versatile 1N34, and its very low price in the surplus market makes it especially interesting to the ham or experimenter. Its big drawback has been in mounting, however, since it is not equipped with pigtailed like the 1N34.

The mounting shown in the photograph is simple and sound, both mechanically and electrically. It may be made in a very few minutes from an inexpensive fuse holder. The clip on one end of the holder is turned ninety degrees, and half of it is broken off by bending back and forth with long-nosed pliers. A blow with a center-punch forms a depression into which the small end of the crystal unit seats. The modified clip is then bent toward the other end of the holder until it holds a slight tension on the seated crystal, as shown in the photograph. The crystal diode can be removed and replaced in the clip as easily as a fuse

C. W.

Method for mounting a 1N21B crystal diode.



TRANSVISION

NEW Television Kits, and Equipment

Important Advances in TV Reception and Servicing!

Transvision makes television more enjoyable, more profitable!



MODEL 10BL TV/FM KIT



NEW FIELD STRENGTH METER

TRANSVISION manufactures the most extensive line of high quality Television Kits, Cabinets, Components, and Special Equipment. Illustrated and listed here are only a representative few of Transvision's leading values. See your distributor.

MODEL 10BL, TV/FM Kit, gives 115 sq. in. picture; complete FM Radio; receives all channels; streamlined cabinet. NET \$249.00
Roto-Table for Model 10BL, gives full 180° visibility. NET \$23.50
MODEL 7CL, TV Kit, gives 60 sq. in. picture; console cabinet with Roto-Table; streamlined design. NET \$199.00
Receives all 12 channels; continuous tuning. NET \$189.00
MODEL 7BL, same as 7CL except that it is a table model.
All prices include cabinets, tubes, all-channel double folded di-pole antenna, and 60 ft. of lead-in wire.

NEW . . . TRANSVISION FIELD STRENGTH METER . . .

Improves Installations! Saves 1/3 the Work! Has numerous features and advantages, including—(1) Measures actual picture signal strength . . . (2) Permits actual picture signal measurements without the use of a complete television set . . . (3) Antenna orientation can be done exactly . . . (4) Measures losses or gain of various antenna and lead-in combinations . . . (5) Useful for checking receiver reradiation (local oscillator) . . . (6) 13 CHANNEL SELECTOR . . . (7) Amplitudes of interfering signals can be checked . . . (8) Weighs only 5 lbs. . . . (9) Individually calibrated . . . (10) Housed in attractive metal carrying case . . . (11) Initial cost of this unit is covered after only 3 or 4 installations . . . (12) Operates from 120 volts—60 cycles. NET \$99.50
Transvision Field Strength Meter MODEL FSM-1, complete with tubes.



NEW ALL-CHANNEL BOOSTER



NEW REMOTE CONTROL UNIT KIT

TRANSVISION ALL-CHANNEL TELEVISION BOOSTER . .

To achieve television reception in weak signal areas, or areas which are out of range of certain broadcast stations, Transvision engineers have designed this new booster. It increases signal strength on all 13 television channels. Tunes all 13 television channels continuously. Can be used with any type of television receiver. Unusually high gain in upper television channels. LIST \$39.95
Model B-1.

TRANSVISION REMOTE CONTROL UNIT KIT. Will operate any TV receiver from a distance. Turns set on, tunes in stations, controls contrast and brightness, turns set off. Ideal for installations where the television receiver is inaccessible. Tuner unit is a high gain, all-channel unit with about 50 micro-volt sensitivity. Easy to assemble in about an hour. LIST \$49.00 Model TRCU, with 25 feet of cable. \$47.00 Without cabinet.

NEW 8-PAGE CATALOG showing complete Transvision line now available at your distributor, or write to:—
TRANSVISION, INC. Dept. R.N. NEW ROCHELLE, N. Y.
In Calif.: Transvision of California
8572 Santa Monica Blvd., Hollywood 46
All prices 5% higher west of Mississippi; all prices fair traded.
All Prices Subject to Change Without Notice.

Radiomen . . . you can
**GET INTO THE
TELEVISION
BUSINESS**
IN A BIG WAY WITH THE
**TRANSVISION
DEALER PLAN**
Write for details now!

NOW! CASH IN ON TELEVISION!!



FM and TELEVISION SWEEP SIGNAL GENERATOR \$34.95

A must for progressive service shops—a buy at this sensationally low price! Accurate!—Aligns FM and television receivers. Frequency range 2-227 MC. Output modulated or unmodulated. High frequency insulation throughout, built-in power line filter and special Midline capacity tuning condenser. Easy to operate—use it to adjust to new TV channels. AC only. Exceptional opportunity to purchase instrument of this kind direct from manufacturer at a tremendous saving!

WIRE RECORDER and Record Player \$109.00



Complete with
2 spools of
wire, cord for
radio recording
and micro-
phones.

FOR PLEASURE OR PROFIT!

Simply press a button and begin recording—anything you can hear, it will record and play back! You can make a permanent record, or with the money-saving "eraser" device use the same wire again and again. ALSO: has a TURNTABLE that plays standard 10 and 12" discs! It's a 3-in-1 machine—and simplicity itself to operate! Microphone has table stand attachment—lets you record programs without use of microphone—gets improved quality. Operates on AC. Beautiful luggage-type carrying case. Size: 9 1/2" x 17 1/4" x 14 1/4".

All items Backed by ECA with RMA Guarantee

Enclosed find check (or money order).....in full
.....20% deposit, bal. COD for the following:

.....Send me FREE ECA Bargain Bulletin.

.....FM Sig. Generator \$34.95

.....Wire Recorder \$109.00

Name.....

Address.....

City.....State.....

ELECTRONIC CORP. OF AMERICA
353 W. 48th St., New York 19, N. Y.

What? Where? and Why?

Three questions that provide the easy answer to many of the time-consuming problems faced by servicemen.

By NICHOLAS B. COOK

MOST successful radio technicians have a formula which, when applied to the servicing of radios and allied equipment, enables them to come up with the right answer in the shortest possible time.

One of the most direct approaches to the problem of servicing can be summarized in three words: *What? Where? Why?* Since the author uses this method, I may be pardoned for describing it in the personal terms of first-hand knowledge.

What?

What is the trouble? Dead? Noisy? Weak? Cuts out? Sounds bad? The customer gives me this information and more if I ask questions carefully. The complaint is written down immediately on the repair tag.

Sometimes a receiver is left at the shop during my absence. My first approach then is still to find out *what* is wrong. I do this, not by looking underneath the chassis or testing the tubes but by *trying out* the radio. By far the best way is to use the "Versatile Test Gadget" described in RADIO NEWS, November, 1944. This is simply a series lamp of 100 watts or so but it gives a lot of information, and safely.

Where?

Where is the trouble? Speaker? Audio section? The r.f.-i.f. section? Power supply?

Looking at the underside of the chassis can waste a lot of time. If the receiver is *dead*, a competent man can tell *where* without turning the chassis upside down. Often he can do this without instruments. *Given the opportunity* I usually do it not in ten minutes but in ten seconds.

Noise can be located almost as quickly, by pulling tubes or grounding grids.

Weak reception is certainly not the fault of the audio section if a finger on audio grid causes a vigorous hum.

Cut-outs are sometimes easy to find, sometimes very difficult. Good clues can be obtained from the aural character of the interruption. A loud snap click usually involves "B" voltage, a quiet stopping may be a coupling condenser, a slow fade is probably of thermal origin.

There are fancy signal tracers that can put a detective in each section of the receiver. They eventually tell you *where* while you have been busy with

more profitable work. In my opinion the best instrument is a simple, sensitive, untuned tracer that can follow the signal without touching any terminals. When the signal stops, you find out *where*. As far as this job is concerned, the soldering iron is still cold but time's a-wastin'.

Hum can be localized as easily as any other noise.

Distortion may require another gesture toward instrumentation, but tube substitution is a simple and rapid preliminary.

Why?

Here is where the high-class man really demonstrates his superiority. Here he employs the cumulative power of knowledge, experience, skill, and native talent.

He knows *what* the trouble is, he knows *where* it is, by purely elementary observation, requiring at most a few minutes (intermittents excluded). Now he focuses his analytical powers not on the whole chassis but on one functional section.

Audio trouble is usually easy to find, if you are looking in the audio section. More than once I have acted as consultant on "weak reception" only to discover *immediately* that the speaker cone was jammed.

Distortion ordinarily is confined to detector and audio sections. Analysis in audio is a simple matter of using ears, meters, and possibly an oscilloscope.

Hum can be immediately analyzed in character and frequency by the use of the scope. When the hum is identified, it is ready for the kill. On one job I encountered a hum that I could not nail down as 60 or 120 cycles. It was a random frequency in between. Given this clue, I had no trouble finding self-oscillation in a voltage regulator tube.

Intermittents are not duck soup for anybody. Touching, tapping, pounding, pulling, twisting, turning, are all involved in the mechanical techniques of locating cut-outs. Plastic pliers and polystyrene probes are excellent helps. When all these fail, we become hunters, possessed of great cunning and infinite patience, for the patience of the hunter is a greater patience than that of the hunted.

Oscillators may be the cause of baffling troubles, but to the man who knows his fundamentals the oscillator is just another circuit.

The high-class man knows all the basic circuits. He fully appreciates the value of circuit diagrams and

NOW READY!



SEND
FOR
YOUR
FREE
COPY
TODAY!

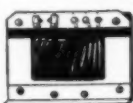


CARBON HANDMICRO
Type T-17B handmicro. S. B. carbon with push-to-talk switch on handle. Brand new. Shpg. Wt. 3 lbs. **ONLY**
Limit of one to a customer

\$1.25

MODULATION TRANSFORMERS
RCA 1 KW Modulation Transformer. Primary will match tubes up to 10,000 ohms plate to plate. Secondary No. 1, 450 MA. Secondary No. 2, 80 MA for beam, tube screen grids.

ONLY \$14.95



Shpg. Wt. 55 lbs

SPECIAL! Save as much as 50% on some of our many smash values in used, Reconditioned, "Good-As-New" Test Instruments and Communication Equipment. Write for complete list of these amazing bargains.

CONVENIENT TIME PAYMENT PLAN
All prices F.O.B.
St. Louis

SMASH! BARGAINS



ALL THE BIG NAME BRANDS OF NEW TEST AND COMMUNICATION EQUIPMENT IN STOCK
IMMEDIATE DELIVERY!

IN SURPLUS EQUIPMENT

PHONE Chestnut 1125

**SURPLUS
RG 8/U COAX CABLE**

Brand New, Nationally known maker.

06c per ft.

\$5.00 **\$45.00**
per 100 per 1000

HAMS LOOK!

Not Surplus!

**Real GALLON
Transformers**

TYPE E-5707

3000 Volts D. C. out of filter at 650 MA. (ICAS). Pri: 115/230 VAC 60 Cy. Shpg. Wt. 47 lbs.

ONLY \$48.00

TYPE E-5706

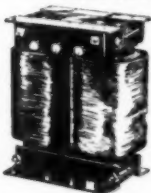
2500 Volts D. C. out of filter at 500 MA. (ICAS). Pri: 115/230 VAC 60 Cy.

Shpg. Wt. 33 lbs. **ONLY \$33.00**

TYPE E-5105

2000-1750-1500 Volts D.C. out of filter @ 500 MA. (ICAS). Pri: 115/230 VAC 60 Cy. Shpg. Wt. 30 lbs.

ONLY \$36.00



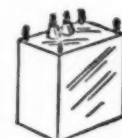
FILTER CHOKES
4 Hy. x 300 Ma., 40 ohms Res #6317. Shpg. Wt. 13 lbs.

ONLY \$4.95



8 Hy. x 500 Ma., 55 ohms Res #8056. Shpg. Wt. 18 lbs.

ONLY \$11.85



No. 8783-2-6 Hy. x 500 MA Swinging Choke. Shpg. Wt. 28 lbs.

\$11.85
ONLY



**FILTER
CONDENSERS**

3 MFD. x 330 VAC. Good 1000 VDC 74c
2 MFD. x 440 VAC. Good 1500 VDC 74c

3 MFD. x 400 VAC. Good 1250 VDC .98c
6 MFD. x 440 VAC. Good 1500 VDC \$1.25

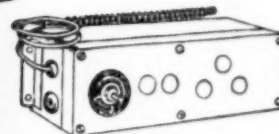
8 MFD. x 440 VAC. Good 1500 VDC \$1.47
2 MFD. x 660 VAC. Good 2000 VDC \$1.47

2 MFD. x 2500 VDC. Oil filled. Well known mfg. Single Lots \$3.43 each. Two or more \$3.25 each.

Shpg. Wt. 3 lbs., all types.



**BOMBSHELL
SPECIAL!**



Reversible Motor

Originally used for heat control on Douglas Bombers. Ideally suited for rotation of lightweight Amateur, FM or TV beams. Geared down to 1/2 to 2 RPM with max. torque rating of 50 inch pounds. Size 2 3/4" x 3 3/4" x 9". Simple instructions included. Shpg. Wt. 6 lbs.

**LIMIT OF ONE
TO A CUSTOMER.**

ONLY \$7.45

Use the Coupon to Prove That YOUR TRADE-IN'S WORTH MORE AT THE WALTER ASHE STORE
WALTER ASHE RADIO CO.

O. H. Kettler, Mgr. Test Equip. Div.
1125 Pine St., St. Louis 1, Missouri

RN-11

Gentlemen:

☐ Rush bigger-than-ever "surprise" trade-in allowance on my _____ for _____

(describe used equipment)

(show make, model of new equipment desired)

☐ Send bargain list of reconditioned, good-as-new (check one or both)

☐ Test Instruments, ☐ Communication Equipment.

☐ Rush my FREE copy of new 1949 Catalog.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

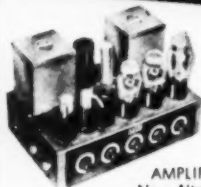
Walter Ashe RADIO CO.

THE HOUSE OF "SURPRISE" TRADE-INS
1125 PINE ST. • ST. LOUIS 1, MO.

November, 1948

MUSIC OUT OF THIS WORLD...
AND THE BEST IN TELEVISION

Visit Sun Radio's BIG, NEW SOUND & TELEVISION STUDIO



AMPLIFIERS!
New Alltec A3238
Net . . . \$133.00



RECORD
CHANGERS!
New Webster Mod-
el 256. For standard
and LP records.
Net . . . \$33.91



SPEAKERS!
New Alltec 4038
Net . . . \$63.00



RECEIVERS!
New Hallicrafters
SX-62.
Net . . . \$269.50

at Sun Radio:

- ★ Choose from the widest selection of nationally famous makes.
- ★ Buy for the lowest prices in town, guaranteed by Sun Radio's 26 years of leadership as radio supply headquarters.
- ★ Personal, unhurried service by our staff of specially trained sound men.
- ★ Exclusive demonstration panel puts 2600 combinations of sound components at your fingertips.
- ★ Free, expert advice on your engineering and installation problems.
- ★ You're always welcome to come in and hear "music out of this world." Never any obligation.

For Real Audio & TV Demonstration
For Sound values—and for real Sound demonstration—Sun Radio invites you to New York's newest and most complete Sound & Television Studio.

It's your new headquarters for the VERY BEST in Audio Equipment (especially high-fidelity), as well as the latest in Television Sets and Kits.

Relax in the comfort of Sun Radio's 1000 sq. ft. Studio, and, under ideal conditions for audio reproduction, choose from New York's largest selection of amplifiers, tuners, microphones, changers, speakers, cabinets, recorders, and TV sets and kits.

Now, for the first time, you can see and hear exactly what you buy—Before you buy. "SEE SUN FOR SOUND & TV" for the latest equipment, for the greatest values.

STOP—LOOK—And LISTEN to the best in Audio & TV at SUN RADIO.

Hundreds of Components always on demonstration!
All leading manufacturers featured!



TELEVISION!
New 10" Hallicrafters,
T-67. Net . . . \$295.00



FM TUNERS!
Browning Model RV-10
Net . . . \$59.50

OUR ONE AND ONLY ADDRESS
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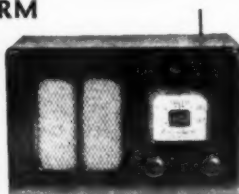
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6-tube superheterodyne, ready to operate. Veneer cabinet 9 1/2 x 6 1/4 x 5 1/4 deep, wt. 6 lbs. Schematic inside back cover, warranty outside. 2 stages high gain 10.7 megacycle I. F.'s. Guaranteed reception from local F.M. transmitters with attached antenna—police, cabs, others. Ready to plug in and use. 115 volts, A.C.-D.C. Power consumed 28 watts. SOME CHOICE DEALERSHIPS OPEN . . . WRITE

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service notes. In looking at a diagram he can instantly divide it into functional sections.

If a circuit does not work he knows what tests to make. For he has learned by experience that the laws of nature are invariable. If conditions are right the circuit *must* work. If it does not, there is a hidden imperfection still to be ferreted out by reason, perspicacity, and common sense.

After the main trouble has been cleared, then is the time to look things over, to make a routine test of tubes, to clean condenser plates and other parts, to realign, etc. Other troubles may appear in the course of the try-out performance. It is often wise to anticipate troubles by replacing doubtful parts.

But the best rule is, *first things first!* What is the trouble? Where is it? Why?

—30—

IMPROVE TV RECEPTION

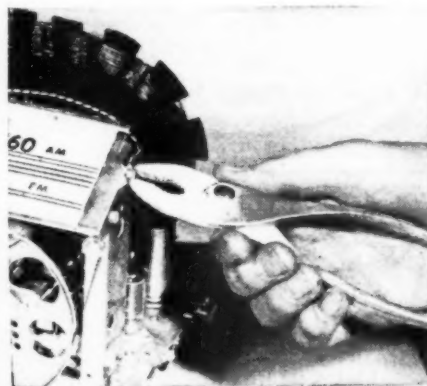
WHEN using 300 ohm line as the feeder for a television antenna system, the length of the feeder is quite critical. To get the best signal input to the receiver the feeder should connect to the antenna coil at a voltage node. A very simple way to accomplish this is to use a piece of tinfoil about 3 inches square. Wrap the foil around the feeder so as to form a shorted loop. Now slide this band away from the antenna post of the television set until the picture strength is at a minimum. Then move the band back towards the set again and one point will be found where the picture becomes brightest.

The tinfoil can be left in this position permanently and, if wrapped with Scotch tape, it won't slide around. When adjusting the feeder length in this manner we automatically compensate for the piece of feeder line connecting the antenna binding posts and the antenna coil. If this adjustment is made on the weakest station you should notice considerable improvement in the picture, while the other channels will not be noticeably affected. . . . M.K.

WHEN POINTER STICKS

WHEN the sliding pointer sticks or works hard on the middle section of the dial look for a "bulged" or raised portion of the dial. This may be checked by pressing downward on the dial with the finger.

Slight loosening of the bolts holding the dial assembly may cure this trouble. . . . H.L.



RADIO & TELEVISION NEWS

International Short-Wave

(Continued from page 65)

By the end of that month, SEAC had closed down and so did the BMA, and Singapore returned to civil government.

"The Voice of Britain" found itself a small island of British Foreign Office staff among vast numbers of Colonial Office officials which position has continued. From July 1946, the staff rapidly increased as new members began to arrive from Britain and from Australia. The scope of programs also increased. Time on the air on August 1 was 7¼ hours. A new studio had been added to the two already in operation. The period of August-December 1946 was one of hard, but often amateurish, work on the part of the program staff. From January 1947, organization began to take a more permanent shape and many improvements were initiated. All the time more and more ambitious programs were attempted as technical equipment was improved and added to by station engineers. A big future seemed assured for the station. But in the autumn of 1947 an economic crisis shook Great Britain and, of course, had its effect even in Singapore.

Early in January 1948, the Controller of Broadcasting called a staff meeting and announced far-reaching changes. Many staff members were dismissed as superfluous and programs and hours on the air were drastically cut. It was announced that the British Broadcasting Corporation, London, would be taking over *BFEBS* from the Foreign Office, and that relays of BBC programs would increase. First relays were taken from BBC in July 1946, and what a thrill it was to link them up exactly with *BFEBS*' own announcements! Yet those relays were few in number compared to those that have been carried during 1948. Miss Ballingall comments that *BFEBS* engineers are artists in clever "go-over" work on the AR-88 triple-diversity receivers they use for picking up BBC for relay.

On July 1, 1946, the station started operation on 15.275 and at the beginning of August of that year transmission on 15.30 began. From April 20, 1947, to January 17, 1948, transmitters were "loaned" to *Radio Malaya* for its lunch-time program at 0530-0630 GMT. This had to stop, however, when *BFEBS*' force was cut down, since there were not now enough engineers to operate the transmitters. On August 17, 1947, a frequency of 9.69 replaced 15.275. Since the BBC also uses this frequency, *BFEBS* limited its use of 9.69 to 1030-1700 GMT from October 3, 1947. The gap from 0800-1030 GMT was filled in by yet another new frequency—21.72—but that was surrendered last March, and its place was taken by 15.30, beamed to 35 degrees. The main 15.30 frequency is beamed

November, 1948

GOODELL

announces 3 important
new developments in
audio electronics

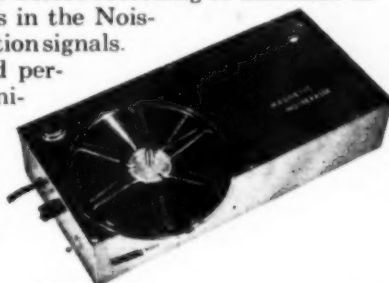
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Restores tape to new condition and permits indefinite useful life with minimum background noise.

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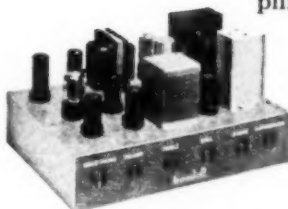
cartridges or with G.E. or Pickering cartridges installed. Sapphire or diamond styli for standard records. Diamond for LP micro-grooves. Special consideration has been given in selecting optimum suspension structures, compliances and bearings to provide perfect tracking with minimum stylus and record wear, as well as maximum stability.

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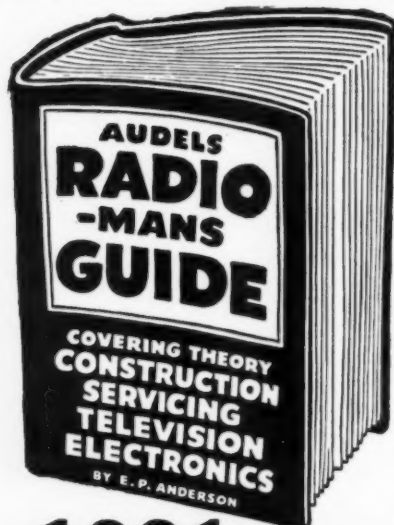
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to 340 degrees. The 11.735 frequency was replaced by 11.77 on December 28, but only lasted to February 8 of this year, when 11.730 was substituted.

The station has requested use of 11.850 to replace 11.730, but at last report permission had not yet been received. Since the 21.72 channel is essentially a long-distance antenna service, it will not likely be put into operation again until higher-powered transmitters are ready. It is expected the BBC, which officially took over *BFEBS* on August 8 of this year, will construct new transmitters (probably of 100 kw. power) in Singapore, but these will probably not go into operation for at least a year or so yet.

Just what changes in policy will be effected by BBC are not yet known. Since BBC does not verify reception reports, it is likely that in future *BFEBS* may adopt a similar course. I have had recent word from the station, however, that it was still verifying the same as it did before BBC took over.

Programs at present are taken from BBC's General Overseas, Far Eastern, and Eastern Services. Schedule is 0415-1130* on 6.77; 0600-1130 on 9.69; 0415-1130 on 11.73, and 0415-1130 on 15.30. News periods are scheduled 0415 (headlines); 0600; 0645; 0800; 0810 (home news); 0915; 0945 (Radio Newsreel relayed from London, *Saturdays only*); 1000 (Radio Newsreel, *except Saturdays*), and 1100, followed

(*Note: Unless otherwise indicated, all time herein is expressed in American EST; add 5 hours for GCT. "News" refers to newscasts in the English language.—K.R.B.)

by news analysis. Transmitters are listed at 7½ kw.

Address of *BFEBS* is Thomson Road Studios, P. O. Box No. 434, Singapore, Malaya.

Finally, here is a brief word about Singapore which is an island 27 miles long by 14 miles wide with an area of 225 square miles. Singapore is the capital of the Straits Settlements, a Crown Colony in British Malaya. Singapore just misses being the southernmost point of Asia by a half-mile water channel. The Johore Causeway joins it with the mainland of British Malaya and affords through train service between Bangkok, Siam, and Singapore. It is at the funnel point of the Strait of Malacca, which extends between the Malay Peninsula and the island of Sumatra, the great water highway between India and China. Area of the Straits Settlement is 1356 square miles, and the 1941 population was estimated at 1,435,895.

Singapore was occupied by Japanese forces in February of 1942 in the conquest of Malaya. It was restored to the British in 1945 with the surrender of Japan. Singapore has a polyglot population of more than 600,000, of which 80 per-cent is Chinese. The port was served by 30 steamship lines and annually was host to 30,000 ships. The city had magnificent banks, modern office buildings, and stately Government palaces.

Incidentally, British Malaya has long provided much of the world's tin and rubber. The Malay States are the greatest source of tin in the world. The British introduced rubber trees

One of the features of a new drive-in restaurant in San Francisco is a unique "wireless jukebox." A patron can drive into the court, tune in his car radio to 750 kc., give a nickel to the car-hop and have the song of his choice come over his car radio. The restaurant's miniature transmitting unit will not radiate more than 80 feet and because it plays music only within this limited range does not need to be licensed by the FCC. Loudspeakers broadcast the music inside the restaurant, in exactly the same manner as any conventional jukebox.



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1E7	59	6C5GT	45	32	12SGT	43	39
1H4	59	6C6	49	45	12SJ7GT	55	49
1H5GT/G	74	6D6	55	45	12SK7GT/G	45	35
1H6	80	6F5	45	39	12SL7	49	43
1J6	49	6F6GT	49	39	12SN7	40	32
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1LH4	69	6H6GT/G	45	39	12SR7	65	55
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1N5GT/G	55	6J8	42	38	14B6		
1R5	59	6J7GT	45	39			
1S5	69	6K6GT/G	50	41			
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1U5	45	6K7GT/G	69	59			
1V	54	6L5G	84	78			
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3S4	79	6SH7GT	44	37			
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5U4G	39	6SK7GT/G	49	47			
5W4GT	39	6SL7GT	49	47			
5X4G	42	6SN7GT	49	47			
5Y3G	40	6SO7GT/G	44	37			
5Y3GT/G	39	6S57	59	49			
5Y4G	49						
5Z3	59						
5Z4	69						
6A6	50						
6A7	49						
6A8GT	53						
6AB7/1853	69						
6AC5	65						
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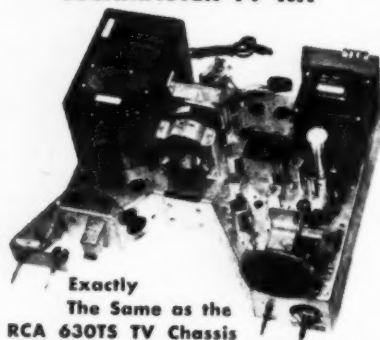


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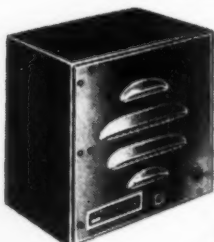
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about fifty years ago from seed smuggled out of Brazil, and rubber trees now practically cover the Malay States.

As we take our leave of the *British Far Eastern Broadcasting Service*, Singapore, which is no doubt destined to become one of the strongest voices in the Far East, we wish the station and its personnel the best of fortune in the years ahead!

New Zealand on Air

By the time you read this, the long-awaited Overseas Service of "Radio New Zealand," Wellington, short-wave division of the New Zealand Broadcasting Service, should be on the air with regular daily transmissions. The New Zealand DX Club, Inc., has sent me the following information on this Service:

"Radio New Zealand" will start regular overseas transmissions on September 27. Mr. Jones, the Minister of Broadcasting, has announced that the Dominion will reciprocate the services given to its listeners by most countries of the world. The service will provide a link with home for New Zealanders living abroad.

"Radio New Zealand" will be on the air daily from 7 to 9 p.m. New Zealand Time (0700-0900 GMT or 0200-0400 EST). Three quarters of the program will be devoted to musical items and a quarter to spoken matter, including a short bulletin of New Zealand news. Programs will carry recitals by New Zealand artists. There will be a weekly session of information designed to reach those who might be contemplating a tourist visit to the Dominion.

The new station will reach New Zealand dependencies and trust territory in the Pacific, and also Australia. Tests indicate that it will also be received in fair strength in New Guinea, the Netherlands East Indies, Malaya, India, and to a lesser degree in the Middle and Far East. Since the two transmitters are of relatively low power by international short-wave standards, being but 7.5 kw., officials say that reception in other parts of the world may be uncertain. However, when these stations tested some time ago, I received widespread reports of good reception from them. They sent a satisfactory signal to my listening post here in West Virginia.

Transmissions will be in the 31-, 25-, and 19-meter bands. I presume frequencies which were tested will be employed; they were ZL2, 9.54; ZL3, 11.78, and ZL4, 15.28.

I was informed by the station some time ago that they will verify; it would be well to enclose an IRC with report. Simply address New Zealand Broadcasting Service, Short-Wave Division, Wellington, New Zealand.

* * *
"Get Up"

Radio Cabimas, YVIRG, 6.150, Cabimas, Venezuela, has a novel "wake-you-up" program, reports D. W. McPheeters, department of Romance

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Complete instrument panel. Remote or local starting. 12 Volt battery and charging system. Engine is an Onan 4 cylinder, 4 cycle water cooled gasoline engine. Rated at 20 HP @ 1200 RPM. Completely metal enclosed, removable sides. Shipped with batteries. Size 72 1/2" L x 27 1/2" W x 38 1/2" H. Wt. 1500 lbs. \$589.00

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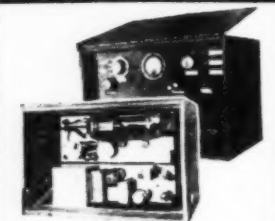
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languages, Louisiana State University. Prof. McPheeters says:

"Cabimas is a little oil town of about 1000 inhabitants, 11 kms. from Maracaibo, so everybody knows everybody else! The patter goes something like this—(sound effect)—Knock! Knock! Knock! Roberto Aguilar, son las seis y cuarto, despiertese! (Robert Aguilar, it's 6:15, get up!) This station is in dual with YVIRV on 4.750 and the announcement goes something like this—'Radio Cabimas en la zona petrolera occidental transmitiendo del lado del lago Maracaibo,' which means 'in the western petroleum zone transmitting from beside Lake Maracaibo.' I usually get it with a fairly good signal."

Listeners' Annual Available

I have just received a copy of The Shortwave Listeners' Annual, 1948 edition, which is now available post-paid direct from the publisher for 3s. 9d. Price in American money is 90 cents, and for one dollar membership in the International Short Wave League will be included. Norman Stevens, who edited the Annual, tells me that a sample copy of Short Wave News will be included gratis with orders, if requested. This is an excellent publication and I heartily recommend it to all DX-ers. Address is Amalgamated Short Wave Press, Ltd., 57, Maida Vale, Paddington, London W.9, England.

Club Notes

England—The International Short Wave Club, London, has been arranging several special DX sessions lately from various parts of the world. The one from Leopoldville, 9.767, Belgian Congo, on September 15 featured a recording made by Arthur E. Bear, secretary of the group. Another broadcast to be dedicated to ISWC will take place Sunday, November 7, from Radio Saigon, 11.78, French Indo-China, at which time calls will be made to as many members as possible. Time for th's broadcast was not known when this was compiled but it is presumed it will be some time around 0500-0600 EST; details will be announced from Radio Australia and by radio clubs throughout the world, prior to November 7. Address of ISWC is 100, Adams Gardens Estate, London, S.E.16, England.

New Zealand—A new DX organization is the New Zealand Radio DX League with headquarters at 15, Plunket Street, Dunedin S2, New Zealand. Address of its house organ, "DX Bulletin," is P. O. Box 283, Invercargill. The League has a combined Board of Directors—5 from Dunedin and 5 from Invercargill. Short-wave editor is Arthur C. Cushen, well-known "Down Under" DX-er, whose QRA is 212 Earn Street, Invercargill. Details may be obtained from the North American agent of the League, Don Trelford, 198 Strathellen Blvd., Toronto, Ontario, Canada.

Sweden—A new radio club in Sweden

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TRANSFORMER—Kenyon Trans. Co. Primary 110V, 60 cy. Secondary 5V. @ 60 Amp. \$4.49
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is Vart Hem's Radio Club, organized in connection with the Swedish weekly magazine "for all the family," Vart Hem (Our Home). Members of this club do not pay any fee but they do receive a membership card and "five formulas" for reception reports. Head of the club is Tell Hellbom who is being assisted in preparation of material by Arne Skoog, well-known Swedish DX-er. During the first week, 300 members were registered. Address of the club is Sveavagen 53, Stockholm, Sweden.

United States—New officers of the Tri-State SWLR Club are Dan Ainsworth, president; Jim Zaloudek, vice-president; Ann Carson, secretary; Walt Carson, treasurer; Charles McCormick, chaplain; Edw. Broome, editor and sergeant-at-arms. Mr. Broome's QRA is Route 1, Vincentown, New Jersey.

Verification Data

VLT5/7, Port Moresby, Papua (British New Guinea) verified for Major, W. Australia, from The Superintending Engineer, Postmaster-General's Department, Engineering Branch, G.P.O., Brisbane, Queensland, Australia.

Address for reports on United Nations broadcasts from Paris is Mr. Boothe, UN Services, Palais de Chaillot, Paris 16, France. The Paris stations have been relaying in Spanish, English, Portuguese, French, and possibly other languages. (McPheeters, La.)

New QRA of Warsaw Radio is Polskie Radio, Koszykowa 8, Warsaw, Poland. (Bengtsson, Sweden)

HLKA, 1 Chung Dong, Seoul, Korea, now verifies with card; mailing QRA is Commanding General, USAMGIK, A.P.O. No. 235-2, c/o Postmaster, San Francisco, California, USA. (Cushen, New Zealand)

This Month's Schedules

(NOTE: Since some stations will be reverting from Summer Time between the time this was compiled and when you read it, you may find some schedules are now one hour later than listed herein.—K.R.B.)

Algiers—Algiers has been reported testing at 1130-1215 on its old frequency of 11.835. (Radio Australia)

Anglo-Egyptian Sudan—Radio Omdurman's 31-m. channel has been roaming around again—heard by Bluman, North Africa, on such frequencies as 9.635, 9.740, 9.670. (Via Radio Australia)

Argentina—Radio Belgrano, 9.545, is heard in Louisiana to 2200 close-down; heard also mornings as early as 0500. (McPheeters)

Austria—Kary, Pa., reports XL2C, 16 890, Vienna, heard to New York with network report at 1100; at time heard used clear speech, signal was marred a bit by a c.w. station.

Rot-Weiss-Rot, 9.575, has early morning musical program 0030; at 0115 gives news in Czech (furnished by Americans). (Pearce, England)

Belgian Congo—Leopoldville, 9.767, is scheduled 1300-1900 and 1900-2300; English periods begin at 1430 and 2100.

November, 1948

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MODEL M12 Medium Voltage (Red)	L-22A	L-76S	P30	P93C	E4	N4	31050*		
	L-25A	L-76AS	P30B	P93D	E4-1	N6	31156*		
	L-26A	LT-M	P30C	P93E	E-9	N6P	32632*		
	L-27A	LT-MA	P30D	P93S	F1	N6P-4	33122*		
	L-32A	LT1-M	P30E	P94	F1P	N8	33217*		
	L-70	LT1-MA	P30S	P94B	F2	N8P	33905*		
	L-70A	LT2-M	P87	P94E	F2P	N9	34225*		
	L-70S	LT2-MA	P87S	W42A	F3P	N11	34307*		
	L-70AS	LT3-M	P87S	W57A	F4P	N11P	34710*		
	L-71	1-J	P90C	W57AN	F5		35171*		
	L-71A	1-M	P90D	W58A	F5P		37158*		
	L-71S	401-A	P90C	W58A	F6P		39686*		
	L-71AS		P90D	W60A	F6			AMERICAN	
	L-76		P93	W60B	F6P			5-1	
	L-76A		P93B	W61B	N2				
					N3				
ELECTRO-VOICE	ASTATIC		SHURE		WEBSTER		BCA		
MODEL H12 High Voltage (Blue)	L-24A	L-72S	P88	W56A	C-21		CR1A		
	L-36A	L-72AS	P88S	W59A	C-31		CR2A		
	L-46A	L-82	P89	99-180	C-61		52		
	L-50A	L-82A	P89S	99-181	N-10				
	L-72	L-82V	W40A		N-10P				
	L-72A	M-23	W41A		N-10P-1				
ELECTRO-VOICE	ASTATIC		SHURE		WEBSTER		BCA		
MODEL L12 Low Voltage (Yellow)	L-40A	LP-6	QC	QT-3JA	C51		71173		
	L-41A	LP-21	QT-J	QT-3M	F3		70339		
	L-75	LP-23	QT-M	QT-3MA	F7P		70338		
	L-75A	MLP-1	QT-2J		N3				
	L-75S	MLP-1J	QT-2M		N3				
	L-75AS	MLP-2	QT-3J		N7				

Use "A" mounting plate furnished with cartridges (1/2" hole centers) for all replacements except those marked with an * or †. Use "B" mounting plate furnished (1/2" to 1 1/4" hole centers). Use "C" mounting plate furnished (Webster Side Flange). †Use "C" mounting plate furnished to ASTATIC "A" type except All Model 12 Cartridges equivalent to ASTATIC "A" type except Tone Arm Rest Button is not supplied. It is recommended that the lower voltage cartridge consistent with volume level be installed. NOTE: Models M12, H12 and L12 have Osmium-Tip Needle. For Cartridge with Sapphire-Tip Needle, specify Model M12-S, H12-S, or L12-S.

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.002	—	600V 3.95
.003	—	600V 4.40
.005	—	600V 4.40
.006	—	600V 4.40
.01	—	600V 4.40
.02	—	600V 4.95
.03	—	600V 4.95
.05	—	600V	..... 4.95
.1	—	600V	..... 7.20
EACH			
.25	—	600V	.....\$0.12
.5	—	600V	..... .17
5	—	25V	..... .14
10	—	25V	..... .16
25	—	25V	..... .18
10	—	50V	..... .22
100	—	50V	..... .29
16	—	150V	..... .18
20	—	150V	..... .24
20/20	—	150V	..... .26
30	—	150V	..... .28
40/20/20	—	150V-25V	..... .44
40/40/20	—	150V-25V	..... .44
50/30	—	150V	..... .44
4	—	450V	..... .24
8	—	450V	..... .27
16	—	450V	..... .36
16/16	—	450V	..... .59
20	—	450V	..... .39
30	—	450V	..... .47
40	—	450V	..... .59
80	—	450V	..... .97
.005	—	1700V	..... .13
.008	—	1700V	..... .15
.01	—	1700V	..... .17
.02	—	1700V	..... .19
.05	—	2500V	..... .58
.1	—	2500V	..... .64
.25	—	2500V	..... .86
.05	—	3000V	..... .69
.003	—	5000V	..... .57
.005	—	5000V	..... .62
.01	—	5000V74
.05	—	5000V97
.0005	—	7500V58
.003	—	7500V67
.005	—	7500V72
.0005	—	10000V64

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128

A special series entitled "Amongst Friends," in answer to listeners' letters, is radiated during the two *English* transmissions (except Sundays), and usually follows the news period. A preview of the coming week's program is given each Sunday 1445 and 2115.

Brazil—Ferguson, North Carolina, received an airmail verification from the new Recife station; schedules listed PRL-6, 780 kc., 0600-2100; ZYK2, 15.145, 0600-1400; ZYK2, 6.085, 1600-2100; ZYK3, 9.565, 0600-0800, 1000-1400, 1400-2100, all transmissions begin one hour later Sundays. Transmitters are Marconi Type SWB-10, 15/20 kw. input, modulated high level Class "B" feeding Beverage-type antennas orientated 258 degrees QRT S 03 20 South 34 58 12 West. Address is Harry W. W. Walden, Chief Engineer, "Radio Jornal Do Comercio," Recife, Pernambuco, Brazil. This station has been heard well from Sweden to Australia.

McPheeters, La., reports PRL8, 11-720, Rio de Janeiro, 0415-0500, announcing sometimes as *Radio Maua*, occasionally as *Radio Nacional*.

British New Guinea—Stein, Calif., says both outlets of Port Moresby's new station are heard well on West Coast; VLT7, 9.520 signs off at 0300 and VLT5, 7.280, comes on the air at 0315. At times interval signal appears to be bagpipes.

In verifying for Major, W. Australia, gave power as 2 kw. in aerial.

Canada—On West Coast, VE9AI, 9.535 (listed 9.54), "Voice of the Great Northwest," Edmonton, Alberta, is heard surprisingly well for only 200 watts; best around 1730-1900. (Smith, Calif.)

Ceylon—Colombo's 4.900 channel has been heard lately in California, mornings, best around 0830. (Dilg)

Chile—CB-1180, 11 998, Santiago, relays the 1745-1800 Spanish period from *Radio Brazzaville*. CE1174, 11.742, Santiago, has news 2200-2215 (presumably in Spanish), and gives evening schedule at 2230 according to which closes down at 0000. (McPheeters, La.)

China—Latest Nanking channel is 15.105 which relays XGOA broadcasts 0300-0915, with news 0400 and 0800. (It may be that at least some days there is a break or that it does not sign on until 0700.) Widely reported with good signal. This is the new 20 kw. outlet, replacing XGRZ, 17.765, and call is believed to be XGSO although only call announced is usually XGOA. Reception reports are desired by the station to XGOA. The Central Broadcasting Station, 25 Sze Tang Hsiang, Nanking, China. Tests on XGSW, 21.450, at 1930-2200, had been concluded and 15.105 is now used by Nanking at that time for relaying XGOA; news at 2015 and 2130. (Balbi, California and Huse, Washington) *Radio Australia* reports that at 0400 XGOA announces 15.105, 5.985, and 9.730 all in parallel.

XGHT, 6.096, appears to have drifted down slightly, does not seem on top

of Cebu's 6.100 outlet as formerly; improved signal. (Dilg, Calif.)

The daily newscast period from XNCR, approximately 7.500, a Communist-controlled outlet, is now at 0840. (Dilg, Calif.)

XMAG, 4.275, Nanking, is again audible on West Coast. (Dilg)

XORA, approximately 11.700, Shanghai, has not been reported to me lately; does anyone have information on this one? Some time ago *THE BROADCASTER*, W. Australia, reported it on 9.820; however, that is the frequency of another Chinese outlet, XGOE (Kweilin).

In verifying for Stien, Calif., Hong Kong sent schedules showing ZWB3, 9.52 (actually appears 9.525) at 2330-0100 and 0530-1000; carries *English* programs from medium-wave ZBW (845 kc.) at 2330-0015, 0530-0630, 0800-1000, and Chinese programs from medium-wave ZEK (640 kc.) at 0015-0100, 0630-0800; news scheduled 0000 (followed by local weather report and forecast), 0600 and 0300 (relayed from BBC, London), latter followed by weather report and forecast. QRA is Hong Kong Broadcasting Studio, Gloucester Bldg., 2nd Floor, Hong Kong. Stien sent along an IRC and received prompt verification of his report.

Colombia—McPheeters, La., reports a new Colombian group heard at 2100-2300 (not complete schedule); they are HJCK, 830 kc., HJKB, 6.000, and HJKF, 9.520. Anxious to receive reports to Emisoras Nuevo Mundo, Bogota, Colombia. Station is being operated on a temporary permit from the Ministerio de Correos y Telegrafos. The 9.52 outlet has been reported also by Balbi, Calif.

Stark, Texas, reports Radiodifusion Nacional de Colombia on 11.680, opening 1700.

Cyprus—Herbert Bluman, North Africa, reports to *Radio Australia* that "This is your Forces' Broadcasting Service, Cyprus," is being heard on 7.220 from 2200; relays BBC news from London 2300; when closing 1500 leaves air with recording of Ted Lewis' "Goodnight." (It is probable this is old JCKW, Jerusalem, moved to Cyprus.—K.R.B.)

Czechoslovakia—Prague's 11.76 outlet is heard in England opening 1030 (is heard earlier on 15.320); *English* heard 1245 on 11.76 and 1445 and 1645 on 9.55. (Pearce)

Denmark—Tests on Denmark's 9.520 outlet at 1230-1400 have been heard at good level in South Australia. (Gillett) Also heard in England. (Pearce) Heard in Florida at opening, weak, soon faded out. (Gardner)

The *Danish Radio*, Copenhagen, has informed Worris, N. Y., that the 9.520 outlet which tests weekdays (not Sundays) 1230-1400 is non-directional which explains at least in part why has been inaudible usually in America; the 15.165 channel, used 1100-1230 (except Sundays), is beamed to the United States-Canada and is well received in America. Station expects to

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RELAYS

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Whether you require large quantities of relays for production runs or single units for laboratory or amateur work, Wells can make immediate delivery and save you a substantial part of the cost.

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The following list represents only a tiny portion of our relay stock. Write or wire us for information on types not shown.

STANDARD DC TELEPHONE RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 101	24V	1500	DPST (NO)	Auto Elec.	\$1.35
R 102	24V	400	SPDT	Auto Elec.	1.10
R 103	24V	DUAL 1000	3PST (NO)	Auto Elec.	1.35
R 104	24V	600	3PST (NO)	Clare	1.20
R 105	24V	1300	3PST (NC)	Clare	1.25
R 152	12V	50	DPDT SPST (NO)	Guardian	1.10
R 153	12V	200	SPDT SPST (NO)	Stromberg	1.25
R 154	12V	200	SPST (NO)	Clare	1.20
R 155	12V	100	SPST (NO/NC)	Auto Elec.	1.15
R 156	6V	50	4PST (NO)	Stromberg	1.10
R 157	6V	50	DPST (NO)	Stromberg	1.10
R 158	6V	12	3PDT 3PST (NO)	Auto Elec.	1.05
R 161	6V	10	3PST 2NC 1NO	Auto Elec.	90
R 121	150V	5000	2PST (NO) SPDT	Clare	1.75
R 123	150V	6300	SPST (NO)	Clare	1.75
R 402	150V	6500	3PST (NO)	Clare	1.75
R 515	24V	750	SPST (NO)	Clare	1.25
R 517	12V	250	DPST (NO)	Clare	1.20
R 519	250V	14000	SPDT	Auto Elec.	1.95
R 520	250V	14000	DPDT	R B M	2.10
R 521	12V	1000	DPDT	Kellogg	1.20
R 166	24V	DUAL 200	DPDT SPST (NO)	Stromberg	1.59
R 168	24V	DUAL 200	4PST (NO)	Auto Elec.	1.20
R 240	250 350V	40000	DPST (NO)	Auto Elec.	2.95
R 241	48V	650	SPDT SPST (NO)	Clare	1.25

TYPE 18 DC TELEPHONE RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 109	24 48V	4000	SPDT	Auto Elec.	\$1.50
R 110	24 32V	3500	SPST (NO)	Auto Elec.	1.75
R 112	90 120V	6500	SPST (NC)	Auto Elec.	1.75
R 114	24V	500	4PST (NO)	Auto Elec.	1.30
R 603	24V	400	DPST (NO)	Auto Elec.	1.25
R 238	24V	150	DPDT SPST (NC)	R B M	1.25
R 239	24V	180	DPST (NO)	Auto Elec.	1.25

SEALED DC TELEPHONE RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 125	24V	300	DPDT	Clare	\$2.75
R 126	90-120V	2000	DPDT	Clare	3.60
R 504	24 70V	2800	SPDT	GE C103C25	3.00

V TYPE DC TELEPHONE RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 164	24 32V	1000	SPST (NO)	W E.	\$1.20
R 512	24 48V	3500	DPDT	W E.	1.30
R 513	12 24V	300	DPDT DPST (NC)	W E.	1.20
R 514	4 6V	60	SPDT	W E.	1.05
R 526	6V	35	DPDT SPST (NC)	W E.	1.05

AC-STANDARD TELEPHONE RELAYS

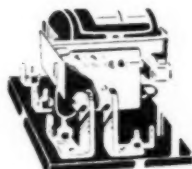
Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 212	90 135V	—	NONE	Clare	\$0.95
R 213	5 8V	—	DPST (NO)	Clare	1.50
R 605	24V	—	3PST (NO)	Auto Elec.	95
R 606	24V	—	DPST 1NO 1NC	Auto Elec.	95
R 607	24V	—	SPST (NO)	Auto Elec.	95

DIRECT CURRENT MIDGET RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 132	24V	300	DPDT	Clare	\$1.20
R 133	24V	300	NONE	Clare	60
R 134	24V	250	4PDT	Clare	1.20
R 135	24V	300	SPST (NC)	Clare	1.15
R 137	24V	300	SPDT	Clare	1.15
R 138	24V	300	4PST (NO)	Clare	1.15
R 139	24V	200	DPDT	Clare	1.15
R 140	24V	280	SPDT	R B M	1.15
R 141	24V	280	3PST (NO)	R B M	1.15
R 142	24V	400	DPDT	Allied Cont.	1.20
R 143	24V	280	SPST (NO)	R B M	1.15
R 144	24V	250	SPST (NO)	Allied Cont.	1.15
R 145	24V	300	DPST (NO)	Allied Cont.	1.15
R 146	12V	125	DPST 1NO 1NC	Clare	1.10
R 147	9 14V	75	SPDT	Guardian	1.05
R 148	12V	100	DPDT SPST (NC)	Price Bros.	1.10
R 149	6 8V	45	SPST (NC)	Clare	1.00
R 150	6V	39	SPST (NO)	E Z Elec.	95
R 522	2 6V	2	SPST (NO)	R B M	1.90
R 523	90 125V	6500	DPDT	Clare	95
R 222	12V	100	DPST (NO)	P & B	95
R 242	24 32V	300	DPDT	R B M	1.20
R 243	24 32V	300	4PDT	R B M	1.20

WELLS
SALES, INC.

November, 1948



SENSITIVE DC RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 218	4 6V	1800	SPDT	Kurman 220C	\$1.95
R 220	75V	5000	SPDT	Allied Cont.	1.70
R 221	18 24V	5000	SPST (NO)	Allied Cont.	1.15
R 174	250V	5000	DPST (NO)	G M	1.85
R 175	350V	11000	DPDT DPST (NO)	G M	2.95
R 176	24V	250	DPST (NO)	G M	1.50
R 177	24V	300	4PDT	G M	1.65
R 600	8 12V	5000	SPDT	S Dunn KS	2.10
R 507	24 48V	DUAL	SPDT-DPST (NC)	Guardian	1.15

TYPE 80 DC RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 169	24V	250	SPST (NO)	Allied Cont.	\$1.95
R 171	24V	230	DPDT	Allied Cont.	2.15
R 172	5 8V	30	DPDT SPST (NO)	Allied Cont.	1.70
R 173	2 6V	5	SPST (NO)	Allied Cont.	1.25
R 529	24 48V	1000	DPDT	Allied Cont.	2.50

TYPE BJ QC RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 204	12V	150	DPST (NO)	Allied Cont.	\$1.15
R 205	24V	260	DPDT	Allied Cont.	1.25
R 224	12V	75	SPST (NO)	Allied Cont.	1.15
R 237	27V	230	DPDT	Allied Cont.	1.25

HEAVY DUTY KEYING RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 248	28V DC	150	SPST (NO) 10A	Guard 36421	\$1.05
R 244	75V AC	265	SPST (NO) 20A	Leach 1327	1.75
R 206	24V DC	150	SPDT 3 AMP	P&B RL	1.20
R 207	24V DC	210	4PDT 3 AMP	P&B RL	1.10
R 219	5 6V DC	1500	DPST (NO) 15A	P&B SP	1.25
R 217	115 AC	600	SPDT 10 AMP	S Dunn 1KX225	1.25
R 525	24V DC	200	DPDT 10 AMP	Guard 34454	1.25
R 508	110 AC	600	SPDT 6 AMP	Guard 37189	1.95
R 506	24V DC	300	DPST (NO) 6A	Guard	95
R 510	24V DC	200	3PDT 10 AMP	Guard 516983	1.05
R 604	24V DC	200	SPST (NO) 30A	S Dunn B2A	1.25
R 608	115 AC	35	SPST (NO) 20A	S Dunn 1HXK225	1.25
R 620	12V DC	35	3PST (NO) 10A	Guard BK2	1.05
R 223	28V DC	150	SPST (NO) 40A	Price Bros.	1.35
R 230	12 24V DC	80	DPST (NO) 10A	—	1.20
R 231	74V	230	DPST (NO) 5A	R B M	1.15

DC-TYPE 76 ROTARY RELAYS

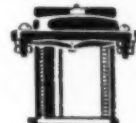
Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 197	9 16V	70	DPDT	Price Bros.	\$1.65
R 198	9 16V	125	4PST 1NO	Price Bros.	1.65
R 199	24 32V	250	SPDT DPST (NC)	Price Bros.	1.65
R 200	24 32V	275	3PDT SPST (NC)	Price Bros.	1.65
R 201	24 32V	250	DPST (NO) SPDT	Price Bros.	1.65
R 601	9 14V	60	3PST (NO)	Price Bros.	1.65



DIRECT CURRENT KEYING RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 190	12V	65	DPDT 10 AMP	Advance Elec.	\$1.15
R 191	28V	125	DPDT 10 AMP	Type 2000 A	1.20
R 192	12V	44	3PDT 10 AMP	Allied Cont.	1.35
R 193	5 8V	11	DPDT 10 AMP	Type NBS	1.05
R 194	24V	265	SPST (NO)	Type 1027	1.05
R 195	6V	32	DPST (NO) 10 AMP	Leach	1.15
R 196	12V	50	DPDT 10 AMP	Type 1054SNW1	25
R 242	24V	170	SPST (NC)	G E Co	1.15
R 236	5 8V	18.5	SPDT 10 AMP	Leach 1253DEW1	25

CUTLER HAMMER HEAVY DUTY CONTACTORS



Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 178	24V DC	100	SPST (NO) 100A	614H34A	\$3.65
R 179	6V DC	6.5	SPST (NO) 50A	604H83A	3.00
R 180	12V DC	25	SPST (NO) 50A	604H308	3.25
R 181	24V DC	65	SPST (NO) 100A	604H88B	3.55
H 232	24V	55	SPST (NO) 30A	Metal Cased	3.25
H 233	6V	15	SPST (NO) 50A	Metal Cased	3.15
H 235	24V	70	SPST (NO) 100A	Type B6	3.85

DIRECT CURRENT AIRCRAFT CONTACTORS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 182	28V	80	SPST (NO) 25 A	Guardian	\$1.85
R 183	24V	60	SPST (NO) 50 A	Allen Bradley	2.75
R 184	28V	50	SPST (NO) 100A	Type B6A	2.95
R 185	24V	100	SPST (NO) 50 A	General Elec.	2.75
R 186	24V	132	SPST (NO) 50 A	Leach 5055ECR	2.75
R 187	24V	100	SPST (NO) 50 A	Leach 7220-3	243.50
R 188	24V	200	SPST (NO) 50 A	Allen Bradley	2.95
H 234	14V	45	SPST (NO) 30 A	Allied Cont.	1.65

ANTENNA CHANGEOVER RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 192	6-12V DC	44	2PDT 10 AMP	Allied-NBS	\$1.35
R 231	12VDC	100	DPDT 6 AMP	G. E.	1.95
R 256	24-32V DC	—	SPDT-DPST (NC)	Guardian	1.45
R 501	110 AC	4	1KW	G. E.	2.45
R 503	12-32V DC	100	SPDT-SPST	G. E.-500W.	1.95

COMBINATION PUSH BUTTON AND REMOTE RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
H 244	12 24V DC	Dual 60	SPDT	CR2791 R106C8	\$1.65

ADJUSTABLE TIME DELAY RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 246	115 AC	—	SPST (NO) or 1NC 10 AMPS	R W Cramer	\$8.95

DC MECHANICAL ACTION RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 245	12V	200	2 Lever	G. M.	\$0.95
R 527	6-12V	200	2 Lever	—	95

TYPE C.M.S. RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 511	24V DC	200	MICRO-SW SPST (NO)	Clare	\$2.45

DC CURRENT REGULATOR

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 509	6-12V DC	40	SPST (NC)	G. E.	\$2.85

LATCH AND RESET RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 500	12V DC	10	DPDT 10 AMP	S Dunn-CX-3190B	\$2.85

DC-ROTARY STEP RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 621	6-12V	30	3 POLE 23 POSITION	W E.	\$10.95

DC-RATCHET RELAY

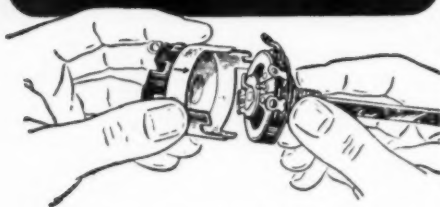
Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R 230	5-8V	2	SPDT-DPST (NO)	Guardian	\$2.15

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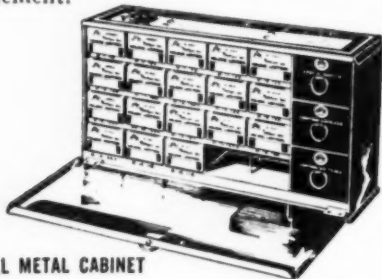
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proves you're right

Remove the cover from an IRC control, and from any other reputable control. You'll immediately see the superior IRC construction. Features that insure long dependable performance. Point by point, compare IRC's design to that of any other control and you'll know you're right when you ask for IRC!

Notice—the terminals are riveted assuring positive electrical contact. Gliding "5-finger" contactor provides smooth gradation of volume. Silent Spiral Spring connector eliminates principal source of control noise. Resistance material bonded to bakelite base gives an even, long wearing element.



ALL METAL CABINET

Add time-saving convenience to the other features of IRC controls by buying a practical stock in this handsome all-metal cabinet. With this minimum investment of 18 Type D Controls plus switches and special shafts, the sturdy cabinet is furnished at no extra charge. You pay only the standard net price of the merchandise. Fast moving control stock in this IRC cabinet services 90% of the Howard Sams RED BOOK listings.



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begin regular transmissions in October for Danish-Americans, and by November also with special broadcasts (in English) about Danish topics. These periods will be beamed to America, probably around 2000-2200 daily, and most likely will be heard on the 15.165 (beamed) channel. Reception reports should be sent to Danish State Radio, Short-Wave Section, Copenhagen, Denmark. Will have QSL cards available soon.

Dutch New Guinea—Biak Island is being heard in South Australia "sporadically" until closing between 0700 and 0710 on (announced) 4.895; popular records are played before this closing announcement (in English)—"You have been listening to the General Network Station, YDZ, Biak Island, which operates on 4.895. We invite you to listen tomorrow night at the same time." (Gillett) This one has been a "mystery" to Paul Dilg, Calif., for some time—but he identified it as Biak just a few days before I received this confirmation from Gillett.

Egypt—SUX, 7.865, Cairo, is now heard 1030-1630 or later. (Radio Australia)

Eritrea—The AFRS programs reported from neighboring countries as audible on 4.000 were harmonic radiations (since suppressed) of experimental AFRS Asmara transmitter, using 250 watts on 1000 kc. medium-wave. (Bluman, North Africa, via ISWC)

Ethiopia—Radio Addis Ababa, 9.620, is scheduled Sundays 0300-0530; Sundays 0300-0530; weekdays 0600-0700; also re-opens 1045 and probably runs to at least 1130. (Radio Australia)

French Indo-China—Hanoi's old Radio France has moved from 6.048 to 6.190; best around 0700. (Radio Australia)

Germany—The widely-reported German station on 15.105, heard with news in German 0930-0945, is DSTB, Munich; relay may be from Soviet-controlled *Berliner Rundfunk* since at beginning of the news period a man announcer says "Hier ist ihr Berlin" (Here is your Berlin). (Kary, Pa.)

The Hamburg outlet formerly 6.115 has moved to 7.290 where it sometimes suffers bad "ham" interference. Munich stations relaying "Voice of America" broadcasts are scheduled—Munich III, 6.080, Munich IV, 7.250, Munich II, 9.540, and Munich I, 11.870, 1100-1700; Munich III beams to Europe in general, the others to Eastern Europe.

Pearce, England, reports *Radio Munchen*, Nuremburg, on 6.160 with news in German, 1000; now has program different from that on 6.080; during period in German, to 1100, mentions "Hier ist Berlin," which call is also heard on 6.080 in the 1700-1800 radiation.

FOVA, "Den Danske Brigade-Radion," has transmission on 6.225 weekdays 2300-0000 (Sundays 0000-0100), 0600-0700, 0900-1100, 1300-1400; Thursdays runs 1300-1645 in last period. QRA is Den Danske Brigade i Tysk-
(Continued on page 191)

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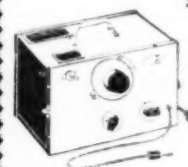
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SIGNAL GENERATOR

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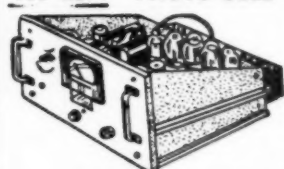
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Build your own High-fidelity Amp. Has mike and Phono. Input. Tubes 1-5U4G, 1-6XJ7, 1-6SN7, 2-6V6 Push-Pull. Universal Output. Schematic Diagram all parts and tubes included. \$14.95

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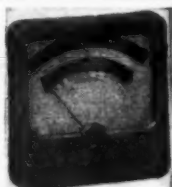
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C-81	10	C-88	4-16	200	3.45
C-82	10	C-89	4-16	250	3.35
C-83	8	C-90	3-14	300	3.85

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lytic in can with mtg
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100,000 ohms,
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sions 4 1/4 x 5 x 5 1/2. Net Weight 10 lbs. \$3.95

Special 2.40

2 1/2 Volts C.T. @ 10 Amps. 7500 Volt
RMS Type 40. 1.65

6.3 Volts C.T. @ 3 Amps. 2500 Volt
RMS Type 46. 4.50

10 Volts C.T. @ 10 Amps. 3000 Volt
RMS Type 316.

SHURE X-TAL MIKE & STAND

Made to list for \$16.00
Our Special Price \$5.50

HEINEMAN CIRCUIT BREAKER

Magnetic Type 5 Amp. 95c
Size

SOCKETS

Low Loss Steatite Wafer Sockets for 829,
832, and 813 Tubes Each 73c

PLATE TRANSFORMER

Primary 115/230 Volt, 25-60 cycle.
Secondary 820 Volts Center Tapped
at 775 Ma. Hardly any voltage
drop at 950 Ma. Completely
shielded. Dimensions 6 1/2 x 6 1/2 x
7 1/2. Net weight 36
lbs. Special \$7.95



OIL FILLED CONDENSERS

1 Mfd. 600 Volt D.C. Sprague \$.49

8 Mfd. 1,000 Volt D.C. Tobe 1.69

0.5 Mfd. 600 Volt D.C. Bathub. Each19

10 for 1.50

7.5 Mfd. 330 Volt A.C. G.E.98

2 Mfd. 10,000 Volt D.C. C. D. 13.95

1 Mfd. 750 V. Sprague25

Dual .1 Mfd. 600 V. CD Type D.Y.R. each19

Per 100 10.00

SURPRISE OFFER

Add \$1 to any order you send and get
10 boxes of R.C.A. Parts.

POWERSTAT VARIABLE TRANSFORMERS

Type 20: 115 V. input, 0-135 V. output
@ 3.0 amps. 0.4 KVA \$12.50

Type 116: mounted; 115 V. input, 0-135
V. output @ 7.5 amps. 1.0 KVA.... 23.00

Type 116U: unmounted; 115 V. input,
0-135 V. output @ 7.5 amps. 1.0 KVA 19.00

Type 1126: 115 V. input, 0-135 V. out-
put @ 15.0 amps. 2.0 KVA 46.00

Type 1226: 230 V. input, taped at 115
V. 0-270 V. output @ 9.0 amps. 2.4
KVA 46.00

Type 1156: 115 V. input, 0-135 V. out-
put @ 45.0 amps. 6.1 KVA 118.00

VARIABLE CONDENSER

6 Gang; 1 section of .00025 Mfd, 4 sections .000035
Mfd, 1 section of .00005 Mfd; with 5 air trimmers
of 15 to 25 Mmfd capacity. This condenser is
all silver plated. Each, only 95c

SCOPE OR TELEVISION TRANSFORMER

Primary 115/230 VAC 60 cycles
355 V. @ 250 Ma.
710 V. @ 200 Ma.
Secondary }
Windings } 1420 V. @ 170 Ma.
385 V. @ 20 Ma.
5500 V. @ 2 Ma.
Fully shielded. A big special, only..... \$9.95

PLATE TRANSFORMERS

For Small Transmitters. DC Voltage Ratings are Approx. Values Obtained at
Output of a 2 Section Choke Input Filter. Using Mercury Vapor Rectifier Tubes
Pri. is for 115 V. 60 cy.

Type No.	Sec. Rms. Volts	Sec. DC Volts	DC Sec. MA.	Dimensions			Price Each
				H.	W.	D.	
P 57	660-660†	500	250	4 1/4"	3 1/2"	4 3/4"	\$5.33
P 58	550-550	400	125	4 1/4"	3 1/2"	5	7.20
P 59	1080-1080	1000*	150	4 1/4"	3 1/2"	5 1/2"	6.00
P 67	500-500	750	225	4 1/4"	3 1/2"	5 1/2"	17.85
P 68	900-900	600	300	5 1/4"	6 1/4"	4 1/4"	21.30
	1450-1450	1200	300	5 1/4"	6 1/4"	4 1/4"	
	1175-1175	1000	300	5 1/4"	6 1/4"	4 1/4"	
	2100-2100	1750	300	5 1/4"	6 1/4"	4 1/4"	
	1800-1800	1500	300	5 1/4"	6 1/4"	4 1/4"	

* For dual operation with simultaneous use of both sec. ratings.
† Has 40-volt bias tap.

SELSYN MOTORS



115 Volt AC 60 cycles. Transmis-
sion only. Can be used to turn small
beam antenna or as indicators only.
3 1/2" Diameter x 5 1/2" High. Ship-
ping Weight 10 lbs. Special per
Pair—

\$5.95

TUBES

3C24 Triode 100 Watts output: 6.3 Volts
3 amp. Filaments 2000 Volts plate @ 75ma.
Each 39c. \$3.50

2x2/879 Rectifier 2.5 Volts 1.5
amp.49

BIAS TRANSFORMER TYPE KS 8779

Completely shielded, Insulator Terminals.
Primary 115 Volts 60 cycle
Secondaries 180 V. @ 20 Ma.
300 V. @ 20 Ma.
6.3 V. @ 1.2 amps.
5.1 V. @ 7 amps. \$1.95

Special

STANDARD STEEL CHASSIS

13 x 17 x 3 Black Crackle \$2.22

13 x 17 x 4 Black Crackle 2.58

11 x 17 x 3 Black Crackle 1.86

Made of 1/16 inch steel

SMALL ITEMS YOU MAY BE LOOKING FOR

Shielded Phone Plug.....\$0.30

10 for 2.50

Arc 5 Banana Plugs. Per Doz..... .10

Per 100 1.00

1/4 Amp. 3 AG Fuses. Per Doz..... .25

1 Amp. 3 AG Fuses. Per Doz..... .25

1/100 Amp. 8 AG Instrument Fuses.
Per Doz.50

110 V. Pilot Assembly..... .39

6 V. Pilot Assembly..... .19

1/4 Watt Neons Double Contact
Bayonet Base20

Per 100 15.00

HEAVY DUTY CHOKE

6 Henries at 550 Ma. 28 Ohms DC Resistance. High
voltage insulation. Completely shielded. Dimensions
5 1/2 x 4 1/2 x 5 1/2. Net Weight 15 lbs. \$4.95

Special

RELAYS—CS DIFFERENTIAL

Dual coil with armature pivoted
between coils. All contacts
normally open. Operates 220-
250 Volts. 8000 Ohms each
coil, contacts S.P.D.T. Controls
rated 2 amps. at 110
VAC. Ideally suited for bal-
anced or bridge type circuits where limited current or
power is available. Will withstand 12 G Vibration up
to 60 cycles at 35,000 feet altitude. Special 88c
low price



MULTIPLE CONTACT

Telephone Type
#882—2 wind-
ings. Each 125
ohms.
#881—Single
winding. 12500
ohms.

49c



WIRE

No. 10 Copper Enamel, 100 Ft. \$1.75

Lengths, Each 1.25

No. 12 Copper Enamel, 100 Ft.83

Lengths, Each 1.95

No. 14 Copper Enamel, 100 Ft. 6.75

Lengths, Each 1.95

300 Ohm, Twin Lead Plastic covered, per
100 Ft. 1.95

RG-59U 72 Ohm Coaxial Cable, 7c per
Ft., per 100 Ft. 6.75

If not rated 25% with order, balance C.O.D.
All prices F.O.B. our warehouse New York. No
order under \$2.00. We ship to any part of the
globe.

LEEDS RADIO CO.

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NOW! BUILD 15 RADIOS \$14.75
COMPLETE KIT ONLY...

ABSOLUTELY NO KNOWLEDGE OF RADIO NECESSARY
YOU NEED NO ADDITIONAL PARTS!

THE PROGRESSIVE RADIO KIT is the ONLY COMPLETE KIT

Operates on 110-120 volts AC/DC. Contains everything you need. Instruction Book, Metal Chassis, Tubes, Condensers, Resistors and all other necessary radio parts. The 36-page Instruction Book written by expert radio instructors and engineers teaches you to build radios in a professional manner. The first circuit built is a simple one-tube detector receiver. Each succeeding circuit incorporates new arrangements of detectors, RF and AF amplifiers. This kit is excellent for learning the principles of receiver, transmitter and amplifier design. It is used in many radio schools and colleges. All of the commonly-used detectors are used, including diode, grid leak, plate and infinite impedance. The transmitters are designed with Hartley and Armstrong oscillators, using screen-grid and control-grid modulation. Both vacuum tube and selenium rectification

are employed in these circuits. The circuits are designed to provide excellent performance. Altogether, fifteen circuits are constructed, including 11 receivers, 1 audio amplifier, and 3 transmitters. The sets start with simple circuits of 1 tube plus rectifier, gradually grow more complex, and finish with several examples of radio sets using three tubes plus rectifier.

PROGRESSIVE RADIO KIT... ONLY \$14.75
SPECIAL FREE OFFER
 Electrical and Radio Tester sent absolutely FREE with each Progressive Radio Kit, PLUS FREE membership in Progressive Radio Club. Entitles you to free expert advice and consultation service with licensed radio technicians. Write for further information or ORDER your KIT NOW!

WE PAY POSTAGE ON PREPAID ORDERS—C.O.D. ORDERS SHIPPED COLLECT

RECHARGE your AUTO BATTERY with the NEW AUTO RADIO with Built-In BATTERY CHARGER AND POWERIZER FOR ELECTRIC SHAVER

Sensational Features

- Powerful 6-Tube radio • 3 Gang Condenser • Extra R.F. Stage (for increased sensitivity) • Large P.M. Speaker • Single Compact Unit • Easily Installed
- Charges through radio • Simply Plug radio cord into 117 v. A.C. electric outlet • Makes winter starting sure • For electric shaver • Just plug shaver into radio extension cord.

ONLY \$34.97 List Price **\$49.95**

Automatic AUTO RADIO

Tops in car radios, now at a new low price! Six-tube superheterodyne with steady, full-toned reception. Mounting brackets included for easy installation in your car. Don't miss this big bargain!

- Six Tube Superheterodyne • Three Gang Condenser
- Powerful Long Distance Reception • Fits All Cars, Easy Installation • Mounting Brackets Included

ONLY \$27.97 List Price **\$39.95**

TOM THUMB BIKE PORTABLE RADIO

- TELESCOPIC ANTENNA • EASY MOUNTING • POWERFUL RECEPTION • BEAUTIFULLY FINISHED METAL CASE

Can be mounted on bicycle or carried as a personal portable radio. Supplied complete with all bicycle mounting hardware and telescopic antenna. Simple mounting—quickly detachable. Whip antenna, slide rule dial, vernier tuning, full size Alnico No. 5 speaker, operates on inexpensive flashlight cells and standard 67½ volt "B" battery. Attached handle for ease in carrying as a regular portable. Light weight case, beautifully hammer-tone finished. Mounting bracket features anti-theft locking device. Size 7¼x4¼x3½. Weight 3 lbs. 3 oz.

ONLY \$17.47 List Price **\$24.95**
LESS BATTERIES

ATTENTION RADIOMEN! SEND FOR YOUR FREE DEALERS CATALOG AND PRICE LIST TODAY!

- RADIO KITS • AMPLIFIER KITS • FM COIL & CONDENSER KITS • RESISTOR KITS • CONDENSER KITS • RADIO TOOL KITS • FM-AM CHASSIS • SPEAKERS • RADIO PARTS • PORTABLE RADIOS • CAMERA-RADIOS • TUBES • AUTO RADIOS • HOME RADIOS • TELEVISION SETS • TELEVISION CABINETS • TEST EQUIPMENT • FM TUNERS

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TELEPHONES

Now—Deluxe quality telephones incorporating latest improvements in design and technique. No scrap parts—but real honest to goodness first class material and finest workmanship. Lowered costs due to increased volume make possible this special low price of \$14.50 pair of either

DESK MODEL
 type shown complete with wire, power supply and instructions. Ready to Hook Up
 Special Prices—
 3 Phones \$20.50
 4 Phones \$25.50
 25% deposit required on C.O.D. orders

WALL MODEL

DUNN-WRIGHT ELECTRIC CO.
 667 6th Avenue
 Brooklyn, N. Y.

RADIO COURSES

Preparatory, Broadcast, Marine Operating, Servicing, Aeronautical, Television, Frequency Modulation, Radar.

Classes forming for winter term Feb. 1. Entrance examination Jan. 20.
 Veteran Training Literature

COMMERCIAL RADIO INSTITUTE
 (Founded 1920)
 88 W. Biddle St. Baltimore 1, Md.

Within the Industry
 (Continued from page 28)

Kende who for the last five years served as assistant export manager in charge of dealer business for Montgomery Ward & Co. He will maintain headquarters at Admiral's Chicago plant. A sub-office will be set up at the Admiral Corporation New York City Distributor Division. In addition, all company distributor facilities will be utilized in the New Orleans, Los Angeles, San Francisco, Seattle, Boston, Philadelphia, and Baltimore areas.

KENNETH B. WARNER, WIEH, secretary and general manager of the American Radio Relay League and editor of the ARRL's official organ "QST" passed away September 2 at his West Hartford home, of coronary thrombosis.



Known the world over as a spokesman for amateur radio interests, Mr. Warner's passing came as a shock to hams both here and abroad. At the time of his death he was making preparations to attend the ARRL National Convention in Milwaukee over the Labor Day weekend.

Mr. Warner, who was born in Cairo, Illinois, celebrated his 25th anniversary as managing secretary of the League in 1944. He was a member of the Institute of Radio Engineers, and an honorary member of many amateur radio societies. In 1925 Mr. Warner helped form the International Amateur Radio Union, and a few years later, the IARU was changed to its present form—an international association of amateur radio societies. From that date, as secretary of the headquarters society of the Union, Mr. Warner functioned as secretary of IARU.

In his death radio amateurs have lost a friend and champion. RADIO & TELEVISION NEWS joins his many friends in extending our sincere sympathy to his family and associates.

THE J.F.D. MANUFACTURING CO., INC. of Brooklyn has announced the formation of the J.F.D. Antenna Installation Department.

The department will offer free advice to all servicemen in the analysis and solution of their TV-FM antenna installation and reception problems. This new service is unique in being the first department of its kind supported by an antenna manufacturer for the sole benefit of its customers.

The new service is an outgrowth of the company's antenna installation forums which are now being conducted in television centers all over the country. Mr. Friedman will be in charge of the newly-created department.

Inquiries from servicemen should be addressed to *J.F.D. TV-FM Antenna Installation Service Department, c/o The J.F.D. Manufacturing Co., Inc., 4110 Fort Hamilton Parkway, Brooklyn 19, New York.*

A. C. GABLE has been appointed division engineer for the Industrial and Transmitting Tube Division of *General Electric Company's* Tube Division.



In his new position Mr. Gable will be responsible for the division's design and application engineering and standardizing activities. He was formerly assistant engineer of the division and has been associated with *General Electric* since his graduation from Georgia Tech in 1929.

He was transferred to the Vacuum Tube Engineering Department in November of 1930 and became a section leader on rectifier tubes in 1931. Responsibility for ignitron and thyatron engineering was added later. He continued in that work in the Tube Division until he was given a new assignment as administrative assistant.

AMY, ACEVES & KING, INC. of New York City has been awarded the contract to provide television outlets in all 3008 apartments of the new Fresh Meadows Rental Housing Development at Flushing, New York.

This installation will provide television, AM and FM outlets for all apartments in the 2 thirteen-story, 68 three-story, and 70 two-story buildings in the new housing project of the *New York Life Insurance Company*.

The company's master antenna systems will provide tenants complete television coverage without the usual arrays of many antennas and lead-ins on the exterior of the buildings. All that will be required of the television set owner is to plug in the set's antenna connection into the built-in wall receptacle.

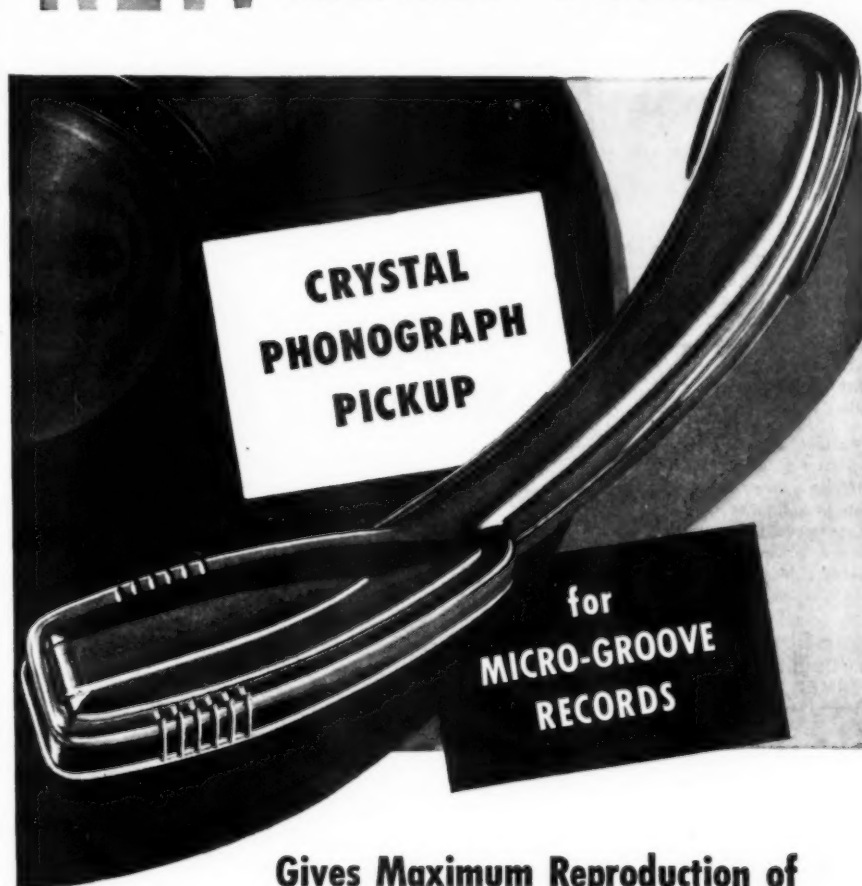
JAMES M. KERBEY is the new general manager of operations for *Krich-Radisco, Inc.*, well-known New Jersey firm of distributors.



Prior to joining *Krich-Radisco*, Mr. Kerbey was senior partner in the firm *Kerbey, Cook and Lamson*, industrial engineers of Philadelphia and Manila. In 1944 he was appointed manager of accounts and finance of the International Division of *Radio Corporation of America*. Just after VE Day, he was loaned by *RCA* to the government to serve as executive secretary to the Foreign Economic Administration, which had as one of its projects, the setting up of controls for the management of the German electronics industry.

November, 1948

NEW SHURE "900MG"



Gives Maximum Reproduction of Micro-Groove Record Fidelity

The Shure "900MG" Pickup is an ideal instrument for tracking on the new micro-groove records. It tracks at 6 grams . . . uses a special offset osmium-tipped needle with a point radius of only .001" . . . and has an output of 1 volt! The Shure lever system has been adapted in the development of this new pickup—providing a high needle compliance. Listen to it—you will be thrilled with the results!

Model "900MG"

Code: RUZUZ

Shure Patents Issued and Pending. Licensed under the Patents of the Brush Development Co.

SHURE

SHURE BROTHERS, Inc.

Microphones and Acoustic Devices

225 W. HURON ST., CHICAGO 10, ILL. • CABLE ADDRESS: SHUREMICRO

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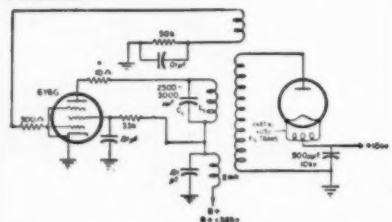
NEW! CORONA-FREE RF FILAMENT TRANSFORMERS FOR TELEVISION AND NUCLEAR RESEARCH



Now, a HI-VOLTAGE, CORONA SHIELDED, TUNED TRANSFORMER ASSEMBLY which includes an octal socket for use with 1B3-8016 type tube!

Filament voltage is easily adjustable through a small access hole in bottom of spun copper cup, allowing tube to be used for voltages from 1KV to 20KV.

TYPICAL 10KV CIRCUIT SHOWING USE OF CORONA-FREE RF FILAMENT TRANSFORMER



This unit is designed to operate in conjunction with RF step-up coils of approximately 200 KC frequency, solving the problem of research workers and experimenters in the construction of CORONA-FREE HIGH VOLTAGE RF POWER SUPPLIES. Ideal for use with our 10KV coil. To obtain 20, 30, 40 KV—or higher voltages—merely use doubler, tripler or quadrupler circuits. To obtain still higher voltage, additional cascade units can be added.

These Corona-Free RF Filament Transformer Units are provided with diagrams and instructions.

A PRECISION-MADE PRODUCT ACTUALLY PRE-TESTED IN CIRCUITS

Net Price—No. V055..... \$5.50
Also Available With A Tested 1B3 Type Tube Complete With Plate Cap.
Net Price—No. V056..... \$7.65

AVAILABLE FOR IMMEDIATE DELIVERY!
25% Deposit With Order. Balance C.O.D.

LIMITED QUANTITIES AVAILABLE! HIGH-VOLTAGE COILS!

15KV—25KV—30KV
Prices sent on request. Write—phone today for yours!

Pioneers in Projection Television
SPELLMAN TELEVISION CO., INC.
130 WEST 24th STREET • NEW YORK 11, N. Y.

From 1941 to 1944, Mr. Kerbey was director and vice-president of *RCA-Victor Argentina*, Buenos Aires. He has also served *RCA* in China and Japan as well as vice-president of the *RCA Victor Distributing Corporation* in Chicago.

JAMES I. MINTEER has been elevated to the post of secretary of *Stewart-Warner Corporation* of Chicago succeeding the late A. R. Benson.



Mr. Minter has been assistant secretary and assistant treasurer of the corporation since 1943. He joined the company in 1942 as fiscal agent of the Green River Ordnance Plant at Amboy, Illinois, the government munitions plant operated by *Stewart-Warner* during the war.

He formerly owned his own mortgage, real estate, and insurance business in Chicago following several years of banking work as trust department manager and subsequent bank liquidation duties for the Illinois State Auditor's Office.

TELEVISION FUND, INC. was recently organized in Chicago to operate as an open-end investment company specializing in securities in the field of television, electronics, and radio.

Television Fund, Inc. was conceived as a "logical medium for participation in the future of the television industry, which we regard as the most dynamic growth potential available to the American investor," according to Chester D. Tripp who heads the group.

The organization is retaining both an advisory board and a technical consultant in order to keep posted and informed of developments within the television field. George P. Adair, formerly chief engineer of the FCC, Dr. William L. Everitt, head of the Department of Electrical Engineering at the University of Illinois, and Dr. Frederick E. Terman, dean of the School of Engineering, Stanford University are serving on the advisory board. The technical consultant to the fund is *Television Associates, Inc.* of Chicago.

JOHN P. KEARNEY, is the newly appointed sales manager of the Industrial and Electronics Division of *Kimble Glass, Division of Owens-Illinois Glass Company*.

Mr. Kearney, a graduate of Fordham University, has been closely associated with glass development in the industrial and electronic fields. During the war, as a Navy lieutenant, he was assigned to handle glass problems on electronics for both the Army and Navy in which capacity he supervised developments, designs, and tests. He wrote the joint Army-Navy specifications for cathode-ray tubes and glassware which are still in effect. He also served as a member of the major in-

NEW! SUPER-TRACER by PRECISION ELECTRONICS

Speeds P.M. and Television Servicing



Highest Gain (12,000)—Lowest input capacity (2mmf, no detuning effects)—20 cycles to over 300 MC—Output meter jack for visual readings—5" speaker checks for hum—locates noise, checks antennas in auto radio work—Model 201 complete with Polystyrene Tip Probe, \$29.95 net.

Write for our catalog on this and other electronic instruments, parts, supplies, etc. Dept. P-11.

RADOLEK CO.

601 W. Randolph St. Chicago 6, Ill.

LIFE ELECTRONIC SALES

Features

"UHF" COAXIAL CABLE CONNECTORS

83 SERIES		Price	
No.	An. No.	Description	Each 100 or More
83-ISP	(PL259)	Plug	\$0.28
83-ISPN	(PL259A)	Plug	.28
83-168	(UG176U)	Reducing adapter for RG 29, 55 and 58U. Use with 83-ISP or 83-ISPN.	.15 .12
83-1R	(S0239)	Receptacle	.35 .28
83-1AP	(M359)	Angle Plug adapter	.28 .22
83-1T	(M358)	Connector	1.25 .98
83-22R	(UG103U)	Receptacle	.45 .35
83-22SP	(UG102U)	Plug	.45 .35

We carry a complete stock of "A. N." and "U. G." series connectors. Call us for your needs.

COAXIAL CABLES

RG8U.....	per 1000 ft.....	\$ 40.00
RG11U.....	per 1000 ft.....	\$100.00
RG12U.....	per 1000 ft.....	\$175.00
RG18U.....	per 1000 ft.....	\$320.00
RG22U.....	per 1000 ft.....	\$125.00
RG29U.....	per 1000 ft.....	\$ 37.50
RG58U.....	per 1000 ft.....	\$ 59.00
RG59U.....	per 1000 ft.....	\$ 45.00
RG62U.....	per 1000 ft.....	\$ 45.00

Prices based on minimum quantity of 500' of a type.

400 CYCLE TRANSFORMERS

Hermetically Sealed
Primary 115 V. 400 cycles:
Sec. #1 6.3 V. @ 9.1 Amps.; sec. #2 6.3 V. CT @ .65 Amps.; sec. #3 2.5 V. @ 3.5 Amps.; sec. #4 2.5 V. @ 3.5 Amps. \$4.95 ea.
Primary 115 V. 400 cycles:
Sec. 2100 V. @ .027 Amps. \$5.95 ea.

LIFE ELECTRONIC SALES

91 GOLD STREET, N. Y., N. Y.
TELEPHONE DIGBY 9-4154-5

RADIO & TELEVISION NEWS

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FACTORY
PRICES!**

**NEW
SERIES 16
SUPER DE LUXE
AM-FM
CHASSIS**

30 DAYS TRIAL

...on the Sensationally NEW 1949 MIDWEST RADIOS

**14 1/2" PANASONIC
SPEAKER**

**5
WAVE
BANDS**

**EASY
TERMS**

**58
OUTSTANDING
FEATURES**

Including the
Exclusive Midwest
FLASH-O-MATIC
Volume and Band Indication
TELEVISION
Audio Switch-Over
FIDEL-A-STAT
Color-Ray Tone Selection
TRI-MAGNADYNE
Coil System
...Plus NO-DRIFT FM
and many other features

COMPLETE WITH FRONT PANEL—READY TO INSTALL!

Here is the last word in radio engineering . . . a powerful, world-ranging, magnificently-toned radio that is unsurpassed for performance, selectivity, sensitivity, and advanced engineering features. Uses these latest-type tubes, rectifier and tuning indicator: three 7A7, three 7A4, two 7C5, one 7A6, one 7Q7, one 6BA6, one 6BE6, one 6C4, one 6AL5, one 5U4, one 6U5. Comes complete with satin stripe copper finish front panel attached, Magna-Tenna Loop Aerial and giant 14 1/2" Electro-Dynamic Panasonic Speaker. Requires only a few minutes to install, plug in and play. **LOW FACTORY PRICES . . . EASY TERMS . . . 30 DAYS TRIAL.** Send TODAY for FREE 1949 Midwest Radio Catalog of separate Chassis and beautiful Console and Table models.

A Complete Line of FINE RADIOS and RADIO-PHONOGRAPHS . . . Available in SEPARATE CHASSIS Like the POWERFUL SERIES 16 AM-FM Model above or in COMPLETE CONSOLES like this...



Beautiful SYMPHONY GRAND AM-FM Radio-Phonograph with TELEVISION Audio Switch-Over and NEW Intermix AUTOMATIC RECORD CHANGER

A Magnificent musical instrument and a masterpiece of cabinet design—the finest Midwest Radio in 29 years of manufacture. Offers world-ranging radio reception and newest automatic Intermix Record Changing Phonograph. Uses Series 16 Super DeLuxe AM-FM Chassis. Giant 14 1/2" Panasonic Speaker; Tri-Magnadyne Coil System; Built-In Loop Antenna. Other luxurious console and table model cabinets available with Series 16, 12, and 8 chassis—on Easy Terms and 30 Days Free Trial.

BUY DIRECT FROM FACTORY and SAVE!

MIDWEST RADIO & TELEVISION CORP.

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909 Broadway,

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SAVE \$ ON RADIO SURPLUS

**U. S. SIGNAL CORPS
5 METER SHORT WAVE XMTRS.**
(72.2Mc) XMTRS and TUBE only, less mike, batteries and antenna. One 1½ volt dry cell and 67½ volts of B operates it. Just attach di-pole, key or mike, connect the batteries and it's ready to use. Signal Corps spec. wired with silvered wire, mica condensers, and precision resistors. Highly stable circuit with Lo-Loss silvered inductance. (Adjustable paddler) Schematic supplied. Converts easily to walkie-talkie and Ham bands. **\$3.25**



GENUINE SIGNAL CORPS FEATHER-WEIGHT HEADPHONES WITH CORD AND PLUG 2000 OHMS—8000 OHMS IMPEDANCE **\$1.00**

**NATIONALLY KNOWN
OIL FILLED FILTER CONDENSERS**
1.—MFD—2000 volts. **95c ea.**
1.—MFD—1000 working volts. 4 for **\$1.00**

FAMOUS BRAND RECORD CUTTING HEAD
These units are all Brand new and were made for a nationally advertised manufacturer to be in their quality Home Recording Radios. Size 1½"x2½" ready to fit your cutting arm or bracket. **SPECIAL. \$2.95**

3 BAND ALL-WAVE DIAL 6" DIAMETER. **75c**

AMPLIFIER CHASSIS, SIZE 18"x8"x2½". BLUE CRACKLE FINISH DRILLED FOR CONDENSERS—TRANSFORMERS AND SOCKETS. **65c**

U.S. AIR FORCE RESISTOR ASST. ¼-½-1 WATT—100 PIECES **95c**

U.S. AIR FORCE MICA COND. ASST. 25 PCS, 50M-1000MMFD **49c**

Low-Loss-Short Wave Variable Condensers ¼" Shaft Type
5 Plate—20 MMFD. **20c**
9 Plate—36-40 MMFD. **25c**
14 Plate—55-60 MMFD. **27c**
27 Plate—100-110 MMFD. **45c**
37 Plate—150 MMFD. **50c**
38 Plate—150-155 MMFD. **55c**
53 Plate—210-21 MMFD. **60c**
Lock Type Air Trimmer Variable Condensers
3 Plate—12-15 MMFD. **10c**
5 Plate—20 MMFD. **11c**
8 Plate—30-35 MMFD. **13c**
10 Plate—40 MMFD. **14c**
13 Plate—50 MMFD. **17c**
14 Plate—56 MMFD. **20c**
20 Plate—80-100 MMFD. **25c**
27 Plate—100-110 MMFD. **35c**

3 GANG T.R.F. VARIABLE CONDENSERS .000365
Cap **95c**

D.P.D.T. SLIDE TOGGLE SWITCH **23c**

2 piece 5-pole **10c**
Male and Female Separable plug. Male is for panel mount. Female for Flex. cord. A steel. at only **.35c per pr.**

SIGNAL CORPS TRANS. KEYS. **39c**

4 PRONG WAFER SOCKETS— **3c each**
PHILCO 4 MF—300 V—1½ CAN CONDENSER— **10c each**
W-L—10 W. 1,000 ohm POWER RHEOSTAT **29c ea.**

5-6 PRONG WAFER SOCKETS. **\$2.50 per C**
100 ASST. SOCKETS—4-5-6-7—OCTAL **\$3.50 per C**

1,000 OHM WIRE WOUND POTENT. **15c**
30 HY-FILTER CHOKE SHIELDED. **49c**
UNSHIELDED **39c**

100 ALLEN BRADLEY—1 WATT—½ MEG RESIS. **\$1.25**

100 ERIE—1 WATT—2,000 OHM RESIS. **\$1.15**
10 WIRE WOUND RES. KIT—5-50 W. ASST **49c**
2 METER RF CHOKES. **7c**

phone PICK-UP REST. RUBBER—I HOLE MTG. **6c**
2,000 OHM WIRE WOUND RHEOSTATS **\$1 per doz.**

RCA-VICTOR NEEDLE CUPS—2 PIECE 10c ea.
CARTER WIRE WOUND C.T. VARIABLE 20 OHM RESISTORS **\$1.00 per doz.**

G. E. TAPPED VOLTAGE DIVIDER—200 WATT—230 OHM—MOUNTED ON ASBESTOS BASE—TAPPED AT 180-205 ohms. **25c**

RCA 6 OHM POWER RHEOSTATS. **39c**
RCA RUNNING BOARD AUTO AERIAL. **49c**
PHILCO AUTO SUPPRESSORS— **\$5.00 per C.** **7c ea.**

MINIMUM ORDER \$2.00—NO C.O.D. SHIPMENTS—PLEASE INCLUDE POSTAGE
NEWARK SURPLUS MATERIALS CO. 324 Plane Street Dept. OC Newark 1, N. J.

GEN. ELEC. WESTINGHOUSE, etc. 60 CYCLE WATT HOUR METERS. slightly used, perfect condition, same as used in your home. 110-125 volts. **5 Ampere. \$3.50 10 Amps. \$4.50**

PHILCO MAGNETIC RELAY TAP SWITCH. Operates on 6 V DC—15 V AC. When contact is made relay operates rotary contacts switch to 20 different contacts. Brand new **.89c**



Philco rotary tap tone control. 3 position, including condensers. Only 1 wire to connect to grid of audio tube. ¼" shaft. **25c**

I. C. A. 30 MH RF choke **25c**

Grind your own crystals—Pure Brazilian Quartz. all sizes and thicknesses—12 lb. packages. **\$1.00**
National Velvet Vernier Dial Attachment—¼" shaft—converts any dial to slow motion vernier. **75c**

340 degree dial with 10 push button attachment—¼" shaft—ideal for Xmitters—Sig Gen. or Osc. **49c**

RCA Band Switches— 3 gang 3 posit. 3 band. **30c** | **HIGH FREQUENCY** 5 gang 5 posit. 4-5 band. **40c** | **Buzzer** **39c**

Trimmer-Padder Asst.—all isolantite—singles, dual, triples—100 ass't. pieces. **\$2.25**

Signal Corps V.T.2 receiving tubes—per doz. **\$1.00**

MAGNAVOX— 12"—100-1100 ohm Dynamic speakers. **\$3.95**
5"—150 ohm AC-DC dynamic. **\$1.49**
6"—P.M. **\$1.49**
5" 5M OHM RCA SPEAKER. **\$1.00**

Spaghetti Assortment—Approx. 75 ft. **75c**

30-WATT—6L6 BEAM POWER AMPLIFIER KIT. Complete kit of parts with all necessary parts—Tubes—Ready to assemble and wire. Plate supply—is provided by an overage extra heavy transformer—(1) Filament supplied by an extra heavy transformer filter, bypass and filter condensers. Sockets all ready mounted on chassis. Volume and tone controls with separate AC switch are provided. Circuit is the latest type of phase inverter system using 1-5Z3, 2-6L6, 1-6CS, 1-6X7, 1-6N7. Chassis has ample room to work on or add more tubes—terminal strips for mounting resistors, etc., are also provided. A large diagram is provided so that a novice may be able to assemble this kit with ease, merely by following the point to point connections that are outlined on the print. Complete 6L6 kit, less speaker and output trans. **\$17.95**

TUBES—6N7—45c; 54—39c; 2A7—39c; 55—39c; 117L7—59c; 27—25c; 15, same as 224—20c; 01A—25c; 31—20c; 85—25c.

DRY ELEC. FILTER COND. ASST. CONTAINS 10 PIECES ALL BRAND NEW 150-450V. **\$1.10**
9 ASST WET ELECTROLYTIC CONDENSERS. **59c**

RADIO EXPERIMENTER'S SURPRISE PACKAGE—CONTAINS BYPASS & FILTER CONDENSERS, SHORT WAVE TUNING UNITS, POWER AND AUDIO TRANSFORMERS, SOCKETS, RESISTORS, CHASSIS HARDWARE, OVER 20 LBS. OF VALUABLE PARTS. **\$4.95**

HEAVY DUTY SHIELDED GENERATOR CABLE, 31½" LONG, WILL CARRY 35 AMPS—3 WIRE, DRILLED CHASSIS FOR 6 tubes 7"x10"x1½" **19c**

—29c; 5"x10"x1½" **25c**
RCA ADJUSTABLE CODE INTERFERENCE WAVE TRAP 456-475 KC. **39c**

MOTOROLA AUTO RADIO VIBRATOR TRANSFORMER **75c**
PHONE JACKS—OPEN & CLOSED AUTOMATIC TYPE **18c**

RCA DOUBLE FILTER CHOKE & SPEAKER Baffle **89c**
ZENITH RADIO CABINET & SPEAKER Baffle **95c**

BOX 15½"x10¼"x8"—WILL FIT 8" SPEAKER—MAHOGANY FINISH—BRAND NEW **39c**

NATIONAL 8-8-450 VOLT CAN FILTER CONDENSER **39c**

EBY SPEAKER VOLUME CONTROL WIRE WOUND 15 OHMS FOR USE IN CONTROLLING VOLUME ON P. A. SPEAKERS, WITH SWITCH—SPECIAL 25c ea. LOTS OF 50. **20c ea.**

SALE—PIANO RECORD ALBUM—SALE **69c**
10"—3 comp.—15c; 4 comp.—20c; 12 comp. 12"—3 comp.—15c; 4 comp.—20c; 12 comp.

RECORD PLAYER CABINET D-32—39c; 16 14½"x10¼"x7"—MAHOGANY MADE FOR MOTOR & PICK & VOL. CONTROL—ROOM FOR SPEAKER & AMPLIFIER. **\$2.95**

LIMITED QUANTITY ONLY
SERVICEMAN'S RADIO TUBE CARRIER—MADE OF BLACK FIBRE STRIP 10"x2"—WITH LEATHER SHOULDER STRAP, LIMITED QUANTITY **49c**

ternational vacuum tube development committees during the war.

He joined the *Libbey Glass Division* of *Owens-Illinois Glass Company* in 1946 and transferred to the *Kimble Glass* division in 1947 as Eastern division sales representative.

RAYTHEON MANUFACTURING COMPANY has purchased at a cost of \$1,082,300 certain government facilities constructed during the war at Waltham, Massachusetts.

The facilities include four major and several minor buildings containing approximately 348,000 square feet of manufacturing, engineering, and storage space, including the war-built Power Tube Building. The equipment comprises specialized power tube manufacturing and test facilities, as well as standard machinery, engineering, and office equipment.

Terms of sale require *Raytheon* to give the United States a 20 year right temporarily to take over the facilities, if needed for national defense purposes. This right may be exercised, however, only if *Raytheon* is unwilling or unable to do the work for which the facilities are needed.

ERIC R. SLAYTON has joined *Audio Development Company* of Minneapolis as sales manager in charge of promotion and distribution of the company's line of electronic and hearing test equipment.



Mr. Slayton came to *ADC* from *Radio Corporation of America's* Victor Division in Philadelphia where he was group sales manager for microwave relay and channeling equipment. His background also includes 20 years of sales and commercial engineering experience with the *Bell Telephone System*.

He received his engineering degree at Pratt Institute and did graduate work at Yale.

F. P. BARNES has been appointed assistant to the manager of sales for the Transmitter Division of *General Electric Company's* Electronics Department.

A graduate of Stanford University, Mr. Barnes joined *General Electric* in 1937, taking the Engineering Test Course in Schenectady. He subsequently spent a number of years in Seattle, where he specialized in industrial electronics and radio communications for *G.E.*

Well-known in radio and electronics on the West Coast, he taught courses in industrial electronic engineering and radio engineering at the University of Washington. Since January of 1945 he has been a Western District representative for the Electronics Department, covering northern California, the Northwest, and Rocky Mountain areas.

RADIO MEN
WRITE FOR
BARGAIN CATALOG OF RADIO PARTS
BUYERS SYNDICATE
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WANTED
Teletypewriters complete, components or parts. Any quantity and condition.
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BLUE PLEXIGLAS SCREENS FOR TELEVISION
7 x 9" lists for \$3.25
Prices on other sizes by request
Dealers and Distributors Invited
ABERDEEN AUTO PARTS
Box 283-N, Aberdeen, Maryland, Phone 258

Television Receivers

(Continued from page 72)

Marker pips, generated by an auxiliary AM signal generator, then permit exact determination of the location of critical response points, such as the video i.f. carrier and the trap circuit frequencies.

The alignment procedure of the video i.f. system starts with the precise adjustment of the several trap circuits. The method is quite simple and readily effected. Place the vacuum tube voltmeter across the video second detector load resistor and the AM signal generator to the control grid (and chassis) of the mixer tube. Set the generator to one of the trap frequencies and then adjust the proper trap until the vacuum tube voltmeter indicates a minimum reading. The minimum point should be quite sharp because only one frequency or, at most, a narrow band of frequencies is to be attenuated. For each trap circuit, the generator should be set to its frequency and the trap frequency adjusted until the meter indicates minimum passage of the signal through the circuit or maximum attenuation.

An alternate method but one which is not as sensitive as the foregoing is to adjust each trap while observing the results on the face of the picture tube. The vacuum tube voltmeter is not required now. This method operates as follows. Connect the signal generator to control grid (and chassis) of the mixer tube, as in the above method. Increase the generator output until a series of horizontal black bars appear on the screen. Adjust the proper trap (the one for which the signal generator is set) until the bars disappear. Follow the same procedure for each trap circuit.

The trap circuit adjustments should be checked again after i.f. coils (or transformers) have been aligned because of the interaction between these circuits. However, as a start, the foregoing trap alignment must be undertaken.

We are now ready to start the alignment of the video i.f. system itself and the method employed will depend upon the type of system found in the set.

Stagger-Tuned Systems

In stagger-tuned systems, it will be remembered that each coil is peaked to a different frequency, the over-all response being the sum of the responses of the individual coils. To align this system, we first peak each i.f. coil to the frequency specified by the manufacturer. This is accomplished by connecting an AM signal generator to the control grid of the mixer stage and placing a vacuum tube voltmeter across the load resistor of the video second detector. The scale to use is the d.c. volts scale—generally not exceeding 10 volts. For each coil, the generator is set to the frequency

November, 1948

Winner by a Landslide!



**The TURNER
MODEL 20X**



MODEL 520X

Equipped with convenient slide-lock switch for on-off operation.



MODEL 5R20X

Equipped with built-in push-to-talk relay switch and cable.

High performance at low cost

On every count the new Turner Model 20X has won the vote of users. Response to voice and music pickups is smooth and even over a desired range of frequencies. Output level is remarkably high. Engineered for dependable service indoors or out with high quality moisture sealed crystal circuit. Light in weight, natural to hold, and most convenient to use. It is equipped with hook ring for hanging. Attractive case is finished in rich baked brown enamel. And the price, complete with 7 ft. cable is exceptionally low.

Write for Complete Microphone Literature

THE TURNER COMPANY

900 17th Street N. E.

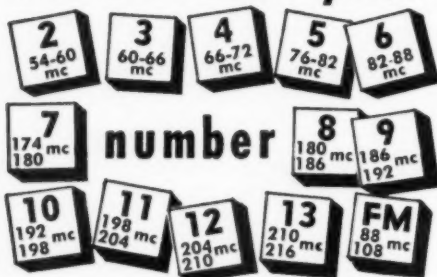
Cedar Rapids, Iowa

Crystals licensed under patents of the Brush Development Co.

Microphones **BY TURNER**



VEE-D-X has your



an Antenna to fit your specific need

Now, the VEE-D-X line of antennas includes three models — each designed to give you the highest gain and maximum operational performance possible. Choosing the right antenna will make the difference between high quality, year round pictures or spotty seasonal reception. Your best buy is VEE-D-X.

For Primary Areas

VEE-D-X SKY MONITOR
Newest addition. This light weight, broad band antenna provides high channel reception as excellent as that on the low channels with a flat response. The batwings, used for high channel reception, can be oriented independently from the main element. The SKY MONITOR incorporates a tunable "Q" section—the big feature found in all VEE-D-X antennas. Light weight, it weighs only 5 1/2 pounds including 6 foot 61ST duraluminum mast. For primary area reception this low cost antenna will give everything desired in a TV antenna. Excellent for FM reception.

MODEL DGA-12 \$19.95 LIST

For Near Fringe or Weak Signal Areas The VEE-D-X JUNIOR

The antenna that has been installed with exceptional results in near fringe and low signal areas. It is a high gain broad band, two bay 16 element array with a matching "Q" section that permits peaking at a desired channel or allows full use of the antenna's broad band characteristics.

MODEL JR-13 \$69.50 LIST

For Long Distance Reception and Extremely Weak Signal Areas

The VEE-D-X SUPER
The antenna that has put TV in homes where it was thought impractical and impossible. The high gain of the SUPER has proved that good reception far beyond the so-called fringe area is possible. The VEE-D-X SUPER is a 4 bay-32 element array that is completely broad band. Its sensitive matching "Q" section provides maximum efficiency in TV reception. No other antenna has so many features.

MODEL RD-13 \$129.50 LIST

LaPOINTE-PLASCOMOLD CORP.
UNIONVILLE, CONN.

VEE-D-X

Adds more vision to television

specified by the manufacturer and the tuning slug rotated for maximum indication on the vacuum tube voltmeter.

To run an over-all check on the system connect the output leads of the sweep signal generator to the same points as the AM signal generator. (Note: The AM signal generator remains in position. It will now serve to provide marker signals). In place of the v.t.v.m. we connect the vertical input terminals of an oscilloscope. The sweep generator is adjusted to sweep a band 6 mc. wide, encompassing the complete video i.f. response (25.75 to 21.75 mc. in RCA sets, for example) plus frequencies above 25.75 mc. and below 21.75 mc. In this way we are certain of observing the full response. When the equipment is in operation, the response pattern of the circuits under test will appear on the scope screen. (A detailed discussion of the proper methods of utilizing the various types of sweep signal generators and oscilloscopes in aligning television receivers is given on page 46). Check the shape of the curve against the one recommended by the manufacturer in his service bulletin. Check each of the end points of the response curve and the trap frequencies by changing the frequency of the AM signal generator to the frequency of each of these points. Note where the marker pip appears on the response curve and then check with the manufacturer's curve to see if the pip is where it should be.

If any slight adjustments are required, they are made with the sweep generator on so that the effect on the over-all curve will be instantly observed. However, if the curve differs considerably from the recommended curve, it is best to realign the system again.

At no time during the alignment procedure of stagger-tuned systems is it necessary to observe the response of any of the individual stages. Keep the sweep generator output low enough to prevent overloading of the video i.f. amplifiers. If the generator output is too high, it will result in an erroneous appearance of a very flat curve. The proper level is indicated when the "Output" knob of the generator can be made to vary the amplitude of

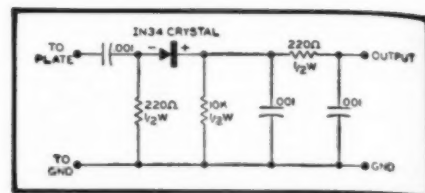


Fig. 7. Circuit of a suitable probe detector.

the response curve on the scope screen without appreciably affecting its shape.

Another important precaution to observe is to prevent the marker frequency from distorting the shape of the video response curve. This can happen when the output voltage from the marker generator is too high. Keep this voltage as low as possible.

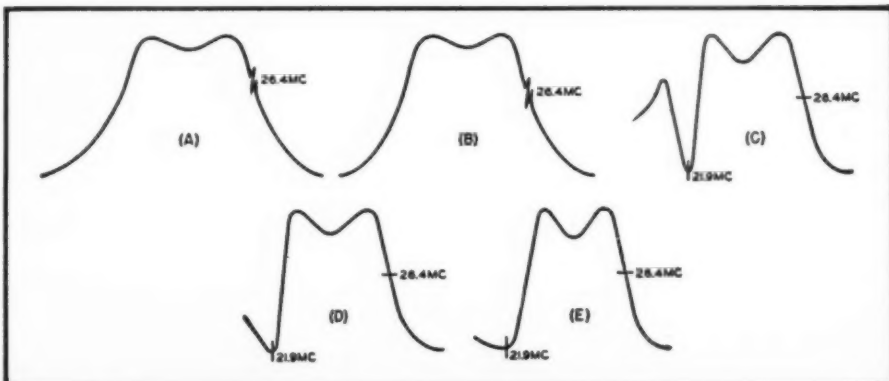
Transformer and Complex-Coupled Networks

When complex and transformer coupling networks are found in the video system, peaking of the individual coils cannot be employed. This is because each stage possesses essentially a 4.0 mc. (or better) width. Under these circumstances, stage-by-stage alignment is required. There are, however, two ways of accomplishing this. In one method, the oscilloscope is connected across the load resistor of the video second detector and the sweep generator travels from the grid of the final video i.f. amplifier back toward the mixer, pausing at each stage while the alignment is carried out. In this method we add to the response curve until, when the sweep generator reaches the mixer, the curve obtained on the screen is the over-all video i.f. response.

In the second method, the response for each stage is viewed individually, with the sweep generator and the oscilloscope moving back toward the mixer together. As a final check the over-all response pattern is observed. The method to be used with any particular set will depend upon the manufacturer's instructions.

To illustrate each method, let us take a set from each group and follow through on a complete video i.f. alignment. The G.E. Model 802, shown in Fig. 5, will serve nicely for the first method. The DuMont circuit, Fig. 4, will illustrate the second method. In

Fig. 8. Response curves for the circuit of Fig. 4. See text for explanation.



STAHL SEZ! Compare Our Values

JEFFERSON TRANSFORMER

Step down (or up) power circuit transformer double wound 230V input 50-60 cycle, to 115V output, 250KVA. Weight 17 lbs. **\$7.95**



SOLAR TRANSFORMER

Step down (or up) transformer, 200V center tapped to 110V; 60 cycle; cap. V.A. 50; metal case, black wrinkle finish; 7 lbs. **\$3.95**

AMERTRAN FILAMENT TRANSFORMER

5V-CT-6.5 amp. 115V-60 cycle AC. **\$1.95**

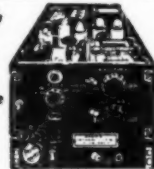
POWER TRANSFORMERS

Current Rating	Sec	Flt	Case	Price
40 Mil	350V CT	6.3V CT-5 amp	Shell	\$1.95
		5V-3 amp		
60 Mil	550V CT	6.3V-5 amp	Full Shell	2.95
		5V-3 amp	upright	
100 Mil	700V CT	6.3V CT-4 amp	Full Shell	3.45
		5V-3 amp	Univ. Mtg.	
200 Mil	800V CT	6.3V-6 amp	Univ. Mtg.	4.95
		6V-4 amp		

RADAR JAMMING TRANSMITTER

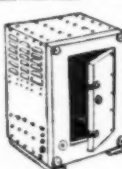
Ultra High Frequency Band width 3 1/2 meg. wide

Model	Range	Price
1-931A	500-700 Meg.	\$19.95
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Standard Rack Cabinets

Heavy gauge steel, gray crackle finish; panel opening 19" wide, 27" high. **\$12.95**



Blank Calibration Books

For HC 221—Frequency from 125KC to 20000 KC printed in 10 divisions—68 pages, aluminum cover, spiral bound. **\$1.50**

Navy Standard Battery

Made by Gould Storage Battery Corp. 6 volt 15 amp hour. Excellent for motors, motorcycles, amateurs, experimenters, radio service men, etc. Shipped dry, with complete instructions for charging. 4 1/2" wide, 4 1/2" deep, 6 3/4" high. Shipping weight 12 lbs. While they last. **\$4.95**

Battery Acid—1275 Sp. Grav.

Can be used in any storage battery—in hermetically sealed bottles. 36 oz. bottle **79c** 92 oz. bottle **\$1.95**

CONDENSERS

G.E.	0.35MFD.	5000V.	\$1.50
G.E.	1MFD.	2000V.	.75
Sprague	1MFD.	3600V.	.95
Sprague	3MFD.	4000V.	5.95
Sprague	1MFD.	1000V.	.39
Sprague	0.5MFD.	1500V.	.29
Aerovox	.02MFD.	8000V.	1.49
Aerovox	.2MFD.	3000V.	2.05
C. D.	.05MFD.	200V.	.19
Solar	.25MFD.	2000V Bathtub	.39

WESTERN ELECTRIC CRYSTALS

IN23, 35c each; 3 for **\$1.00**

HIGH POWER quartz Crystal units, type CFS, 5000KC.

Complete with holder. **1.95**

ANTENNA for SCR522.

.69c

TRIODE 24G/3C24

100 W output. Fil. 6.3V-3A-Plate dis. 25W max plate volts 2,000. Max Ma 75. Here is a real bargain in surplus tubes. One of these tubes will give 100 watts output. Two of them will take 1/4 kw. input. Stock No. 3C24—Each **39c** 10 for **\$3.50**

METERS ALL BRAND NEW

SPECIALS

Westinghouse Bakelite Case

2"	Round 0-10V-AC-DC	\$2.75
2"	Round 0-30 Mil DC	2.25
3"	Round 0-1 Mil DC with bad & good colored scale; can be used in tube checker.	
3"	Square 0-3 amp RF	
3"	Square 7.5 V-AC	Each \$3.45
3"	Round 0-15 Mil DC	
3"	Round 0-35 Mil DC	
3"	Round 0-50 Mil DC	
3"	Round 0-100 Mil DC	
3"	Round 0-150 Mil DC	
3"	Round 0-200 Mil DC	
3"	Round 0-150 V AC	
3"	Round 0-300 V AC	

4 1/4"	Round 0-150V DC	4.95
4 1/4"	Square 0-300 amp DC complete with shunt and leads.	7.95

WESTON Bakelite Case

2"	Round 0-75 amp antenna current Indicator with external couple	\$2.75
2"	Round 0-10V output, portable; in small wooden case.	4.95
2"	Round 0-500V DC external multiplier	4.75
3"	Round 0-3 amp RF surface mount	3.75
3"	Round 0-5 amp external thermo couple	8.50
3"	Round 0-150V AC 400 cycle..	3.45
3"	Square 0-130V AC	3.45
4"	Square 0-20 Mil DC	4.75
4 1/2"	Round 0-5 amp AC with a 0-200 amp scale.	3.95

G. E. Bakelite Case

2"	Round 0-15V AC-DC	\$2.50
3"	Round 0-100V DC	2.75
3"	Round 0-500 Mil DC	3.45

WESTERN ELECTRIC Bakelite Case

3"	Round 0-1000 Mil DC	\$2.25
3"	Round 100-0-100 Mil DC	3.45
3"	Round 20 amp DC charge & discharge	3.45

MISCELLANEOUS

3"	Round Beede 0-1000 Mil DC.	\$ 1.95
3"	Round Triplett 0-150V AC	3.45
3"	Round Burlington 0-75 amp AC	3.45
	Roller Smith portable lab 0-15V DC with handle; 5 1/2 x 6 x 3 1/2	19.50
	Roller Smith portable lab 0-150 Mil DC with handle; 5 1/2 x 6 x 3 1/2	19.50

RCA-CRV-51019 Hand Sets self contained battery operated. Uses 4 pen light batteries excellent for Television Antenna installation. Sold in pairs only. **Pair \$15.00**

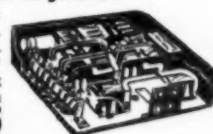
TS-10P Sound power handsets in original export packing. **Each \$15.00 2 for \$27.95**

WESTINGHOUSE PHOTO CELL

Photox, 1/4 mil. D. C. output. Brand New. **\$1.95** Special

Voltage Regulator

G.E. 110 to 220V AC, 400 cycle, single phase-15 amp-20 W; 0-7.2 ohms/2.75 amp; black wrinkle finish metal case. **\$4.95**

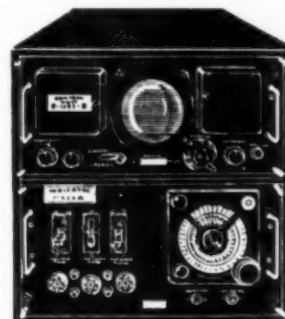


Transtat Voltage Regulator

Type RH 115V AC, 400 cycle .72-KVA-output 75 to 120 V @ 6 amp. black wrinkle finish metal case. Weight 11 lbs. **\$2.45**



IFF EQUIPMENT



1293B Signal Corp Scope Unit

Consists of 5" Cathode Ray Tube and 24 Tubes 1221A Indicator consists of high & low Voltage supply—8 tubes, electric eye & Selsyn indicator 110V-60 cycle AC—can be converted into an excellent scope. Shipping weight 500 lbs. Brand New in Original Case. Special. **\$49.50**

Oscilloscope

3"—BC991B—can be rack mounted; operates on 6VDC or 110VAC. Complete with 2—6116; 4—68F5; 1—68J7GT; 1—68L7GT; 2—5Y3GTG; 1—3P1; in original export packed cases. **\$49.50**



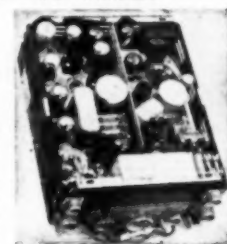
Brand New

COMPLETE SET of spare tubes same as above plus 1 extra 3P1 in export packed case. **\$12.50**

BC-645 X-MITTER-RECEIVER 450 MC—15 TUBES

Brand New

Can be easily converted for phone or CW 2 way communication. Covering the following bands: 420-450 MC ham band, 450-460MC for fixed or mobile; 460-470MC for citizens; 470-500 MC television experimental. Size 10 1/2 x 13 1/2 x 4 1/4. Contains 15 tubes—4-7FT—4-7H7—2-7E6—2-6F6—2-955—1-WE-316A door knob.



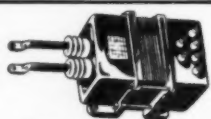
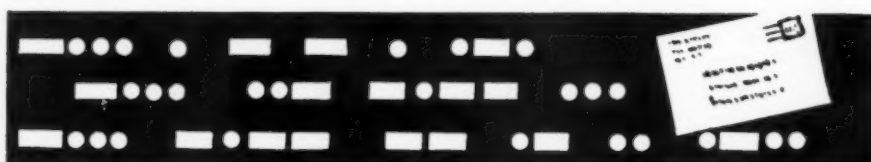
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BC-645 with 15 tubes
PE-101C Dynamotor
Control Head
Instruction Book
\$12.95 Complete

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All Mdse. new unless otherwise specified

Prompt Delivery—25% deposit required on C.O.D. order. Shipped F.O.B. New York. Write Dept. RN10



New American HIGH POWER TRANSFORMER
Perfect for home spot welders, THAWING TRANSFORMER, high voltage filament supply (Insulation test, 35,000 volts). Input: 105 to 125v, 6 taps. 60 cy. Output: 190 amps @ 5v cont. duty. Approx. 1000 amps or more

\$13.95

GENERAL RADIO VARIACS

(Variable Transformer) Like New
Model GR-200-716. Output 0 to 135v at 5 amps. Input: 115v at 60 cyc. Shpg. wt. 10 lbs.

\$12.95

HEINMAN POWER CIRCUIT BREAKERS



Like new! Protect your rig from blown-out fuses. Shipping wt. 2 lbs.
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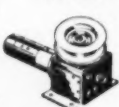
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2x2 mfd.—300v—Oil Bath tub	.33c
2 mfd.—1000v G.E. Pyranol	.69c
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each instance we will assume that the traps have already been properly adjusted.

In the G.E. system, the vertical input leads from the oscilloscope connect across R_1 . This is the video second detector load resistor. The sweep generator is connected between control grid (pin No. 4) and ground of V_2 . Marker signals for the alignment are supplied by a separate AM signal generator. Connect the "hot" marker lead through a 50 μ fd. condenser in parallel with the output lead from the sweep generator. The other lead attaches to the chassis. Keep the level of the marker generator as low as possible. Throughout this entire alignment, the contrast control is placed in mid-position.

When the sweep generator is connected to the control grid of a video i.f. amplifier tube, it is, at the same time, connected across the secondary of the interstage transformer feeding that tube. The primary of this same transformer will be found to act as a tuned trap, producing a hole in the alignment curve as viewed on the scope unless it is short-circuited or detuned. Place a temporary short across the primary. However, be sure to remove the short after the stage is aligned.

With the equipment thus set up, the response curve for T_1 will appear on the scope screen. Adjust C_1 and C_2 until the response curve possesses the form shown in Fig. 6A. This curve is given by the manufacturer in the service bulletin.

Remove the short from the primary of T_2 . The short is not required across the primary of T_2 because the generators themselves are placed here. (The secondary of T_2 serves as a trap. However, it is sharply tuned, and its frequency falls outside the video i.f. response curve. Consequently it need not be detuned.) The two generators are shifted to the control grid of V_2 . The oscilloscope remains across the load resistor of the video second detector. Now adjust C_1 and C_2 until the response curve on the scope screen appears as shown in Fig. 6B. Note that the curve obtained on the scope screen represents the combined response of T_2 and T_1 .

Within the cathode leg of V_2 a resonant circuit (L_1 and C_1) is included. The purpose of this circuit is to reduce the overshoot which occurs to the left of the response curves, Fig. 6A and 6B. L_1 is adjusted by spreading or squeezing its turns for minimum amplitude of the overshoot. (L_1 is peculiar to this receiver and may not appear in other transformer-coupled circuits.)

To align T_2 , connect both signal generators to the control grid of V_1 . Place a short across the primary of T_1 . Adjust C_1 until the response curve appears as shown in Fig. 6C. Now remove the short from T_1 and connect both signal generators to the control grid of the mixer. Adjust C_1 and C_2 until the response curve appears as shown

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in Fig. 6D. (The response of T_1 , by itself, is 5.0 mc. wide to permit amplification of both video and audio signals. Fig. 6D, however, is the response of the entire system and hence the 5.0 mc. spread of T_1 is not visible.) Slight adjustments may be performed to improve the over-all response. However, if the response is considerably off at any point, the entire alignment procedure should be repeated. Some servicemen prefer to align the entire system at once, bypassing the stage-by-stage procedure. This is possible, but only by one who is thoroughly experienced. Otherwise, it is best to follow the procedure as outlined to obtain best results in the shortest time.

To illustrate the second stage-by-stage procedure we will use the DuMont RA-102 television receiver. See Fig. 4. The manufacturer recommends individual stage alignment and this requires that the scope move forward with the signal generators. However, before we start, we must devise some method of rectifying the signal so that it can be applied to the oscilloscope. The output frequency of the signal generator sweeps back and forth at the rate of 60 times a second. When the signal travels through the i.f. system and reaches the video second detector, it is converted (rectified) to a 60 cycle-per-second voltage. This can be fed then to the oscilloscope and a visual response pattern produced. However, when we wish to determine the response of a single intermediate stage (except the last one), it becomes necessary to connect the scope within the video i.f. system itself. Since the vertical amplifiers within the scope will not pass the high video i.f. frequencies, some type of probe detector must be employed to convert this signal down to its sweeping frequency—60 cycles. A probe detector circuit suitable for this purpose is shown in Fig. 7*. The output leads of the probe connect to the vertical input terminals of the scope.

To start the alignment, connect the sweep generator to the control grid of V_1 (Fig. 4). The signal generator which is to provide marker signals is connected to the same point using a 50 μ fd. condenser. Since we are aligning the final video i.f. coupling network preceding the video second detector, the vertical input terminals of the scope are connected across the video detector load resistor. In this circuit this is R_1 . It would also be feasible to connect the scope to the control grid of any video-frequency amplifier following the video detector or even to the control grid of the cathode-ray tube itself. The point chosen is the one most convenient. Adjust L_1 and L_2 until the response curve of Fig. 8A is obtained on the scope screen. The marker signal is set to 26.4 mc., the video carrier i.f. value.

* The components of this circuit should preferably be placed within a probe designed along the lines of the unit described by Donald F. McAvoy in "R.F. Probe Design," RADIO NEWS, March, 1946. RCA manufactures a crystal probe which is ideal for this work.

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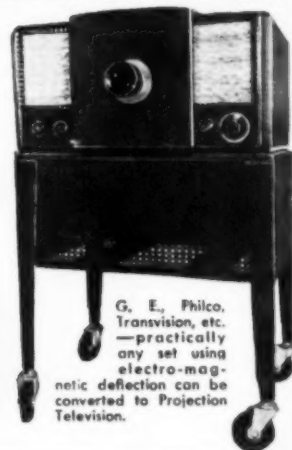
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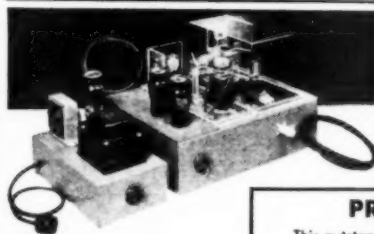
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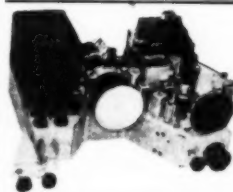


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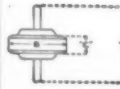
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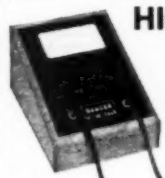


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10-30	300 mmfd	30,000	2 1/4"	1 1/4"	1.05"	2.10 ea.
SKC 20-10	1000 mmfd	10,000	1 1/4"	1 1/4"	.535"	2.52 ea.
20-20	1200 mmfd	20,000	2"	1 1/4"	.800"	3.36 ea.
20-30	600 mmfd	30,000	2 1/4"	1 1/4"	1.05"	4.17 ea.
SKC 30-10	3200 mmfd	10,000	2 1/4"	1 1/4"	.535"	4.17 ea.
30-20	2500 mmfd	20,000	2 1/4"	1 1/4"	.800"	5.01 ea.
30-30	1200 mmfd	30,000	2 1/4"	1 1/4"	1.05"	5.85 ea.



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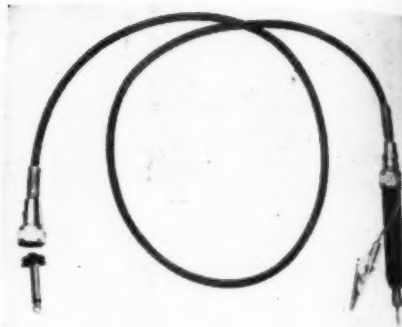
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It should appear at the point indicated in Fig. 8A.

The next stage is now ready for alignment. Shift the sweep and marker signal generators to the grid of V_1 , pin 1. Place the probe detector at the plate of V_3 , with the output of the probe applied to the vertical input terminals of the oscilloscope. The marker signal generator remains set at 26.4 mc. Observe the response pattern on the scope screen and adjust L_1 and L_2 until the pattern of Fig. 8B is obtained. Note that this is solely the response of the coupling network between V_2 and V_3 .

Now shift the two generators to the control grid of V_1 , and place the probe detector at the plate of V_3 , pin 5. L_1 and L_2 are adjusted until the pattern of Fig. 8C is obtained. C_2 is the sound trap adjustment and should be checked to determine whether its setting is correct. With the marker signal generator, check the 21.9 and 26.4 mc. points on the curve. They should appear at the places specified in Fig. 8C.

The generators go next to the grid of the mixer tube. The probe detector is placed at the plate of V_1 , pin 5. L_1 and L_2 are adjusted to obtain the curve of Fig. 8D and the setting of C_1 is checked to determine if the attenuation at 21.9 mc. is as high as possible. As a final check, the over-all curve should be observed and this is done by leaving the generators at the control grid of the mixer and connecting the vertical input leads of the scope across the video detector load resistor or at some other suitable point in the video frequency system (as noted above). The probe detector is discarded for



This crystal probe, designed by RCA to extend the frequency range of the "Volt-Ohmyst," can be readily adapted as a probe detector. When used for this purpose, the output of the probe is fed to the vertical input terminals of the oscilloscope.

this step. Check the frequencies at various points on the response curve using the marker generator. (Fig. 8E.)

A point to remember when aligning the video i.f. system stage-by-stage concerns composite i.f. stages or those which amplify both audio and video i.f. signals. These stages must have a sufficiently wide response to pass both signals without unduly attenuating one or the other. Their bandpass is usually 5.0 mc. and the response should be checked carefully to make sure that the audio carrier receives full amplification.

Servicing of the video i.f. system will be delayed until the video detector and video-frequency amplifiers have been analyzed. All these stages fall into the same servicing package and will be covered as a single unit.

(To be continued)

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By LEON A. WORTMAN

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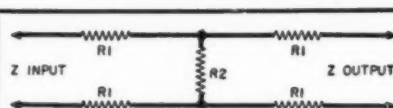
metrical "H" pad. The resistors are supported by their own wire leads and are brought through the sides of the can through small rubber grommets.

The input and output leads are soldered to terminal tie points bolted to two opposite sides of the can. There is no marking on the can other than the attenuation characteristic in decibels. The input and output look into the same impedances.

An extra refinement, although not essential to performance, is to fill the can with paraffin.

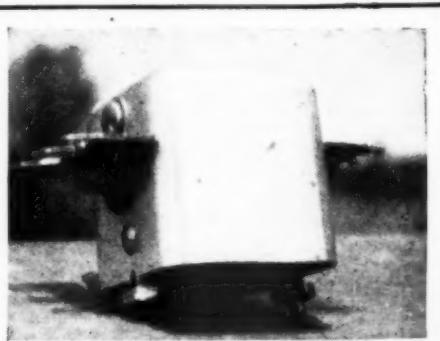
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Circuit diagram and parts values for constructing various attenuation pads for broadcast use. Photograph of completed unit is shown at right.



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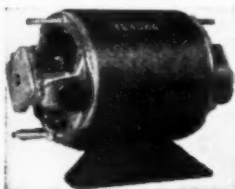
- 10 METER MOBILE RIG
- 20 - 40 - 80 METER BANDS

This sensation of all surplus is not only an ideal 10 Meter Mobile Rig! It's a complete amateur radio station! Here are a few more ways to use the equipment included in this Command Set. The transmitter VFO driver stage gives your BC-375-E higher RF output—as high as 150 watts. Make swell standby receivers with the BC-348 on round-table "rag chews." You get all this equipment: 3 Receivers—190-550 kc, 3-6 and 6-9.1 mc; two transmitters, 4-5.3 mc, 5.3-7 mc; four dynamotors—28 volts DC input; 1 modulator with carbon mike input; two tuning control boxes; one antenna coupling box with r-f ammeter; antenna relay and 5000 volt 50 mmfd. WE vacuum condenser (antenna relay can be used with most rigs); and a complete set of tubes for each unit—29 POPULAR TUBES in all. Mechanical cables for remote tuning of receivers supplied for \$1.00 extra. Shipment from our nearest warehouse, East, Mid-West or West Coast.

Cost Gov't
over \$600

TUNING KNOBS for local
control for receivers, 50c ea.
Three for \$1.25

6-VOLT DYNAMOTOR



IDEAL FOR
MOBILE OPERATION

- (300 VDC 80 mills)
6-volt DC input
- (250 VDC 100 mills)
4 to 5 amps.

\$7.95

Just the dynamotor for that glove compartment 10 meter job. Sturdy, well made. 4"x4"x5" mounting space.

Write for Dynamotor Listing

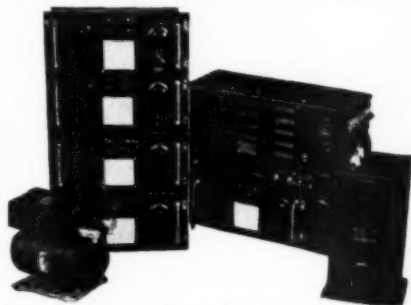
BC-375-E TRANSMITTER

WITH THOUSANDS OF USABLE STANDARD RADIO PARTS

(Gov't cost,
\$1800)

\$49.50

complete

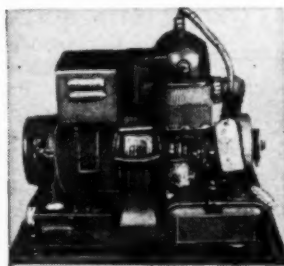


It's been written about and talked about—just the thing for beginner or old-timer; has five tubes, five tuning units. Xmtr. designed to operate from 200 kc to 12 mc. (less BC band). Equipped with antenna tuning unit BC-306-A—variometer and tap switch. Dynamotor (PE-73-C) complete with relay, fuses and filter. Weight approx. 275 lbs. Shipment from our nearest warehouse, East, Mid-West or West Coast.

The Famous "PUTT-PUTT"

GASOLINE GENERATOR
(HRU-28)

28 - 32
volts D. C. ONLY **\$74.50**



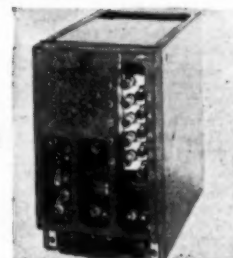
Single cylinder, 2-cycle gasoline engine with generator that is rated at 2,000 watts direct current, 70 amps. Has unlimited use around a farm; useful as field day power supply. More literature upon request.

25 WATT FM- TRANSMITTER-RECEIVER

\$29.50 for special
combination

For mobile or fixed station use; easy conversion to 10 and 11 meters.

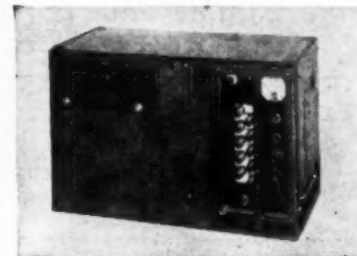
Schematic diagram and information—how to convert to 110 v. AC and amateur use.



BC-603
RECEIVER
(alone)

\$14.95

10 tube, superhet FM receiver; Foster Seely discriminator, 10 channel; pre-tuned, push-button selector; optional manual tuning; adjustable squelch control; speaker mounted in receiver; freq. range 20 to 27.0 mc. Small change in RF trimmers will cover 10 & 11 meter bands. POWER REQUIREMENTS — Receiver 260-280 v. at .08 amps DC, 14 v. at 3.5 amps. AC.



BC-604 TRANSMITTER
(alone) **\$19.50**

10 channel, crystal controlled, selected by push button. Xmtr. has 7 1619 (2.5v 6L6's) for exciter and FM modulator; 1 1624 (2.5v. 807); final amplified 35 watts; crystal oven for 10 crystals, freq. range 20—27.0 mc. 1 0-100 MA meter measures grid, plate, and ant. current. Price excludes crystals. POWER REQUIREMENTS — Transmitter 500 VDC at .22 amps. DC, 14 VAC at 4 amps. AC.

12 v. Dynamotor for receiver **\$9.95**
12 v. Dynamotor for Xmtr. **\$12.50**

1 box of 80 crystals for above, when purchased with trans., \$10.00 per set.

ALL EQUIPMENT F.O.B.

BE SURE TO WRITE FOR BARGAIN BULLETIN

Name.....
Address.....
City.....
Zone..... State.....

R & M RADIO COMPANY

1426 N. QUINCY ST. DEPT. RM-118 ARLINGTON, VIRGINIA

ALL NEW SURPLUS



RATE GENERATORS

Elenco PM-2
2.0 v. DC per 100 rpm.
Use to 2000 rpm. Stock
#SD-53. Price \$7.50 ea.

ELINGO F-16. 2 Phase AC. 1.3 v AC per 100 rpm. 60 cy. output at 1800 rpm. Stock #SD-193. Price \$12.50 ea.

Phase Shift Capacitor—4 stator single rotor 0-360° phase shift.
Stock #SD-114. Price \$4.75 ea.



Remote Position Indicating System



6-12 V. 60 cycles 5 inch indicator with 0 to 360° dial. Heavy duty transmitter. Stock #SD-115. Price \$9.95 per system.

DC MOTORS

Synchron 10 RPM Timing Motor—24 V.
Hanson Mfg. Co. Stock #SD-110.
Price \$3.75 each.

Westinghouse—1171391. 27 V 6.5 amps.
series. Fan cooled. 3" diam. 4 1/2" lg. 1/4 H.P.
Cont. duty. Stock #SD-156. Price \$6.75 each

Constant Speed DC Motor—G.E. 5BA25-
MJ24. 24V DC 7100 rpm. RC noise filter.
Stock #SD-100. Price \$8.50 ea.



G.E. 10 RPM MOTOR. 5BA10FJ12
24 V. DC. 40 lb./in
torque. 1.1 amps.
REVERSIBLE.
Stock #SD-17.
Price \$8.75 each.



Blower Assembly MX-
215/APG 28 V. DC. 1/
100 h.p. motor. John Oster
C-2P-1L. L-R #2 blower.
7000 rpm. 20 c.f.m. Stock
#SD-202. Price \$3.75 ea.

SWEEP GENERATOR

CAPACITOR



Hi-speed bearings. Split stat-
or. Silver plated co-axial type.
5-10 mmf. Stock #SD-167.

Price \$2.75 each

TWX—PAT. 199

Write for complete listing,
or call ARmory 4-3366

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PRODUCTS CO.
Incorporated
Surplus Division

Open account shipments
to rated concerns.
All prices F.O.B. Paterson, N. J.

Paterson, N. J.



28V. DC DELCO CONSTANT SPEED MOTOR A-7155

1/30 hp. 3600 rpm. Cont. duty. 2 1/2" diam. x
5 1/2" lg. 3/4" shaft extension. 1/2" diam. 4 hole
base mounting. Stock #SD-94. Price \$6.50
each.

SPERRY PHASE ADAPTOR—661102. 115
volts 400 cy. Used for operating 3 phase
equipment from single phase source. Stock
#SD-194. Price \$6.75 each.

Radio Compass Loop LP-21-LM. Stock
#D-99. Price \$9.50 each net.

Aircraft Amplidyne—G.E. 5AM31NJ18A.
Input 27 v. DC @ 44 amps. Output 60 v. DC @
8.8 amps. 530 watts, 10 min. duty. Air cooled.
Stock #SD-111. Price \$14.50 each.

G.E. 5AM31NJ9A—similar to above. Stock
#SD-196. Price \$14.50 each.

110 RPM MOTOR

G.E. 5BA10J18D. 27 V. @ 0.7 amps. 1 oz./
ft. torque. 1 1/4" diam. x 3 1/2" lg. Operates on
AC or DC. Stock #SD-98.



Include 15c
for P.P.
and handling
Price
\$2.95 ea. net

SERVO MOTOR

Pioneer Type CK-2.
2 phase 400 cycle.
Fixed phase 26 V.
var. phase. 49 V.
max. 1.05 oz./in. stall
torque. Stock #SD-97.

Price \$4.75 each net.



DYNAMOTORS

D-101. 27 v. DC in @ 1.6
amps. DC output 285 v.
@ .060 amps. Stock #SD-
187. Price \$1.50 each. **DM-40A.** 14 v. DC in
@ 3.4 amps. DC output 172 v. @ .138 amps.
Stock #SD-188. Price \$3.25 each.



Delco PM Motor—5068571

Alnico field. 27 v. DC.
10,000 rpm. 1" x 1" x 2" lg.
0.125 diam. shaft. 3/8" lg.
Stock #SD-151. Price \$3.75 each.

Spot Radio News

(Continued from page 18)

the BBC will continue to operate their 405-line black and white TV system for many years, since any changeover at this time would be too costly to both BBC and the public, and "any change would prejudice more substantial improvements at a later date."

GROUND-BREAKING CEREMONIES FOR WOR-TV were held recently in North Bergen, N. J., with Jack Poppele, vice president in charge of WOR engineering, Theodore C. Streibert, WOR prexy and Paul Cul-lum, mayor of North Bergen, attending the event. The station, which is expected to be on the air early in 1949, will operate on channel 9 (186-192 mc.) and will have F. J. Bingley as its chief engineer. Bingley, a director of TBA, was formerly with Philco in charge of their telecasting activities.

THE MULTI-MILLION mark has been reached in mobile taxi radio sales, FCC reporting that more than \$30,000,000 had been spent for equipment between June 30, 1947 and June 30, 1948.

This large expenditure is certainly a striking tribute to this new service, which a few years ago was nonexistent and today is one of the most important in the commercial communications world.

A UNIQUE USE FOR FM 2-way radio service has been introduced by an electrical shop in Havana, Cuba, for their refrigerator-appliance-radio service trade. Eight cars equipped with 2-way radiotelephone setups, in constant contact with a 60-watt transmitter-receiver in the shop, are able to reach the scene of complaint a few moments after the call for help has been made.

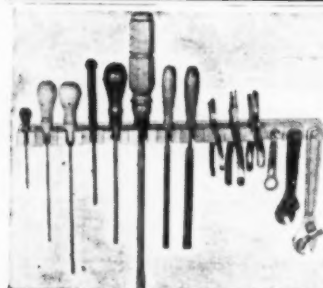
Men assigned to these radio-controlled cars are triple-threat men, having been trained in the servicing of appliance, radio, and refrigeration equipment of the air conditioning or food refrigerator type.

According to Frank Fernandez, vice president and general manager of the shop, G. E. Cubana, who installed the system, the radio service will soon be extended to Santiago de Cuba, and eventually anyone on the island of Cuba will be able to receive service within twenty-four hours via a point-to-point network system.

NEW MULTIPLE STATION OWNERSHIP rules for AM, FM, and TV operators were proposed recently by the FCC. The proposal, which was termed a further step to prevent concentration of control of standard broadcast facilities, lists five rules, which would become effective on January 1, 1953.

According to the rules, no more than seven AM stations could be owned or

Now Available—December 1948 Issue of
RADIO-ELECTRONIC ENGINEERING
Eight pages of technical articles of special interest to engineers in the radio and electronics field.
Send 10c in coin to: Circulation Dept. AE-8
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TOOLRAK SAVES TIME & TOOLS

You always have the right tool at your fingertips when you equip your shop with Toolrak. Because the selected hardwood blocks are interchangeable in the extruded aluminum backstrip, you arrange them any way you want, rearrange as often as you wish. Get Toolrak in factory-assembled sets or buy individual blocks and strips to fit your special needs. Send for free folder.

Set No. 8-7, 8" long, holds 7 tools, \$1.25

Set No. 12-10, 12" long, holds 10 tools, \$1.90

Set No. 18-14, 18" long, holds 14 tools, \$2.55

If your jobber can't supply you, order direct.

Mail orders add 10c per set to cover packing and mailing.

DAVIS DEVELOPMENT CO.

348-2 First National Bank Bldg.
Colorado Springs, Colorado

controlled by one person or corporation, no person or corporation would be able to serve as stockholder, officer, or director of more than 14 AM stations, FM ownership or control would be limited to six stations and television ownership or control would be limited to five stations.

RADAR HAS COME TO THE AID of the commercial fisherman, serving to locate fish seines, in spite of weather conditions, and speeding up the delivery of perishable fish. The R. J. Peacock Canning Company in Maine now use radar equipment aboard their fishing boats to increase the catch of sardines, an extremely perishable fish.

GREAT BRITAIN HAS THE LARGEST number of licensed listeners in Europe, according to a report from the International Broadcasting Union in Geneva. At the end of April there were over 11,000,000 licensees in Great Britain, of which over 49,000 were for television. Germany ranks second, with over 8,000,000 registered at end of December, 1947, including the four zones and the city of Berlin. France follows with over 5,000,000, as of April, 1948, and Italy is next with nearly 2,000,000 listeners, as of December, 1947. Australia, Holland and Belgium follow along with over a million listeners each.

The report also reveals that the plans to extend the French broadcasting network, which were initiated at the time of the liberation, have been completed, and will be placed into operation as soon as funds are voted. Since the beginning of the year, three 20-kw. transmitters, at Nancy, Rouen and Marseilles have been installed. Another 20-kw. station will soon be installed at Bordeaux-Neac, replacing the former transmitter at Bordeaux-Carrere. A long-wave (1648 meter) 20-kw. station will soon be placed in operation at Strasburg and will be on the air until the 450-kw. station at Allouis, formerly Radio-Paris, which was destroyed during the war, has been reconstructed.

Short-wave network plans for France were completed early this year and four 100-kw. transmitters are now on the air on 13 and 50 meters, operating from the Allouis center.

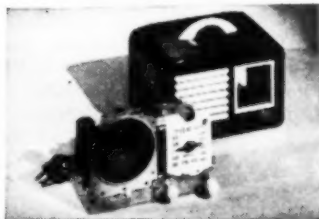
Residents of Paris can now listen to FM from a 5-kw. transmitter at Champs-Elysees (formerly Poste Parisien), operating on 69 mc.

In a review of the history of the Italian Broadcasting Service, the Geneva report reveals that amateur broadcasting began in Italy in 1920, and in 1923, the first broadcasting station with a power of 100 watts went on the air. On February 8, 1923, broadcasting became a government monopoly.

Broadcasting headquarters are maintained at Turin and Rome, both equipped with low-frequency installations. A third station is now being built at Milan.

OUTSTANDING VALUES NOW AVAILABLE

RADIO KIT



Five-tube, superhet, with following tubes—50L6, 12SA7, 12SK7, 12SQ7 and selenium rectifier.

Attractive black plastic cabinet with grill and escutcheon to match, loop antenna, cable drive dial, matched iron core IF transformers, PM speaker complete with all parts, schematic and layout pictures.

PRICE ONLY \$9.95

PARTS SPECIALS— STANDARD BRANDS ALL GUARANTEED

Speakers:

2" PM.....	\$0.89	5" 450 ohm....	\$1.79
3" PM.....	.95	5" 1000 ohm....	1.89
4" PM.....	1.29	6" PM.....	1.69
5" PM.....	1.39	6" 450 ohm....	1.99

Any of above with 2000 ohm transformer attached, 25¢ extra.

10" 4.65 oz. Alnico V PM.....	\$3.95
12" 4.65 oz. Alnico V PM.....	4.95

Fine speakers made by a well-known manufacturer.

ELECTROLYTIC CONDENSERS

40x20 mfd 150V 4 separate leads	49¢, 10 for \$4.50
40x20 mfd 150V 25 mfd/25V	35¢ each, 10 for 2.90
20x20 mfd 400V	49¢, 10 for 4.50
20mfd 150V	25¢ each, 10 for 1.90

Your choice of any of the following electrolytic condensers:

40-10 mfd/200V	50-50 mfd/150V
40-20 mfd/200V	50-30 mfd/150V

35¢ each, 10 for \$3.25

All of fine quality, all guaranteed, while they last.

MISCELLANEOUS VALUES

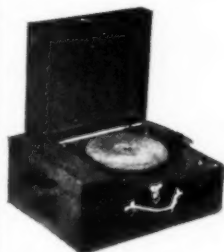
10M Volume Control less sw	15¢ each, 10 for \$1.25
Iron Card plugs	7¢ each, 10 for .60
15 amp 3AG Fuses	10 for 15¢, 100 for 1.20
1 1500V Condensers	12¢ each, 10 for 1.00
Finest quality Crystal Microphone.	Of standard manufacture. Comes complete with 100-ft. cable.

Price \$3.95 each

3-Tube Phono Amplifier: Built of highest quality parts using 50L6, 35Z5, and 12SQ7. Less tubes \$2.95, with tubes \$4.95.

Pick-up Arm, standard Crystal Cartridge, Hi-gain, complete with hardware \$2.25.

ELECTRIC PHONOGRAPH



A MUST for Christmas Sales! Fine for children's records. Compact, beautifully styled. 3-tube amplifier, 5" Speaker, High-Gain Pick-Up Arm, constant Speed Photo Motor, plays 10" or 12" records.

PRICE—\$15.49 each.

LOTS OF THREE—

\$14.95 each.

Radio Parts Company, 614 RANDOLPH ST., CHICAGO 6, ILL.



Special high-quality amplifier system, 15 watt. Now at this low price.

Check these features:

Heavy-duty, attractive carrying case, well-known crystal mike, with cable.

Heavy Alnico V 12" PM—no distortion.

All connectors.

15-Watt amplifier with mike and phono input, 2 separate bass and treble controls, 6 tubes, frequency response 30-15000 cyc +1 db.

Complete \$49.95

SUPERIOR CONDENSERS

These condensers are made for us by a well-known manufacturer. They are quality tested and time proven. We are able to present the 5 most used electrolytics at very reasonable prices.

8 mfd. 450V.....	10 for \$2.25
20 mfd 150V.....	10 for 2.25
20x20 mfd 150V.....	10 for 3.50
10x10 mfd 450V.....	10 for 4.90
50x50 mfd 150V.....	10 for 4.90

Output transformers, Standard 50L6 1/2"x1/2", clinch or strap type mounting. 39¢ ea. 10 for \$3.50

iF transformers, midget type, iron core, 456 KC dimensions 1/4"x2". 99¢ Per pair... 6 pairs \$5.29

Coil Kits: Set of matched ant and RF coils... 55¢

SA7 or A8 oscillator coil... 29¢

Wire Wound Resistor Kits:

Kit of 25 most commonly used 5-10-15-25 watt assorted

wire wound enameled... \$3.00 per kit

A/C cords, 6' with plug, 18¢ ea. 10 for \$1.50

Loop antennas. Ideal for any midget set. Size 3 1/2"x7".

23¢ ea... 10 for \$1.90

Superhet 2 gang condensers 456 KC... 79¢ ea.

6 for \$3.69

AMPLIFIER FOUNDATION CHASSIS

Amplifier Foundation Chassis and Covers presented again BY POPULAR DEMAND. AMPLIFIER MEN and BUILDERS—constructed of high-grade steel, hammerloid finish, sloping panel.



Used by top manufacturers. Size 15"x9"x3".

PRICE NOW ONLY—\$2.75 each.

IN LOTS OF THREE—\$2.49 each.

"XL" PLUGS STANDARD



ON TURNER "77" MIKES ALSO MODEL "87"

TYPE XL PLUGS



XL-13-12 XL-3-11
Pin Contacts Socket Contacts

**THREE 15 AMP. CONTACTS
FOR NO. 14 B & S STRANDED
WIRE**

BRIGHT NICKLE FINISH

CANNON ELECTRIC "XL" Plugs are standard on the two above mentioned microphones; also on RCA's "Announce" microphones and various Electro-Voice models.

More and more microphone manufacturers are turning to Cannon Plugs for quality connector performance at a price that pays off in service and operation satisfaction.

You can buy the "XL" series in more than 375 radio parts stores over the country. For example: in *Kansas City*, Radiolab; in *San Francisco*, Graybar, C. C. Brown, Offenbach-Reimus, Pacific Wholesale, Zack Radio, C. R. Skinner and S. F. Radio; in *New Orleans*, Graybar, Radio Parts, Southern Radio and Wm. B. Allen.

For catalog information, write for XL-347 Bulletin, and the RJC-2 Special Condensed Catalog with list prices. Address Department K-228.

CANNON
ELECTRIC

Development Company

3209 HUMBOLDT ST., LOS ANGELES 31, CALIF.

IN CANADA & BRITISH EMPIRE:
CANNON ELECTRIC CO., LTD., TORONTO 13, ONT.

WORLD EXPORT (Excepting British Empire):
FRAZER & HANSEN, 301 CLAY ST., SAN FRANCISCO

There are 58 studios in use, which are equipped with 36 recorders, 61 playbacks, 366 amplifiers, 140 record molds, 160 amplifiers for music circuits, and 8 mobile trucks.

At Sesto Calende (Milan), there's a checking center which provides measurement and control of frequencies of Italian and other stations, measurement of the field and depth of modulation, collaboration with similar centers in other nations on propagation measurements, and pickup of foreign programs which are relayed by Italian stations.

Reporting on the market for receivers for Germany, IBU says that 650,000 units will be required yearly. A production of about 450,000 is expected this year, if tubes can be supplied. About 85,000 tubes are scheduled for monthly production, but material shortages have reduced these runs to about 70,000.

LICENSING OF NETWORKS BY THE FCC was proposed by former FCC Commissioner Clifford J. Durr, during a meeting of the University of Chicago Religious Radio Workshop. Discussing "Broadcasting in the Public Interest," Mr. Durr said that the present tense relations between networks and the FCC might be eliminated if the Commission had the power to license. This power, permitting a review of programs as now practiced for individual stations, would streamline regulation procedure, he said, and eliminate the fear that FCC rules or regulations are being violated and might cause network cancellations.

RADIO VETERANS AND HAMS, the world over, were shocked to learn of the death of Kenneth B. Warner, managing secretary of the American Radio Relay League.

KB was a founder of the ARRL. He played a prominent role in the organization of the International Amateur Radio Union in Paris, and represented this country at various other international conferences in Europe. He was scheduled to go to Bogota, Columbia, next spring to attend another radio conference for this country.

THE FOURTEENTH FLOOR of the Bekins Building in Hollywood became quite a hectic scene during the latter part of August, when an advance corps of construction workers, engineers and technicians converged to begin transformation of the floor into studios and offices for KTTV, the Los Angeles TV link of CBS.

When converted, the floor will house a large TV studio with accommodations for three sets, a teleciné studio for film telecasting, master control room, announcer's booth, newsroom, engineering laboratory, carpenter and set shops and set and property storerooms.

The transmitter will be installed atop 5700-foot Mt. Wilson, in a building next to the FM transmitter of KNX, the CBS station in Hollywood.L.W.

METERS—WESTON—G.E. 3" ROUND

0-30 KV 4.25 0-1.5 Kv	\$4.25
0-50 MA 4.25 0-150 V AC	4.25
0-250 MA 4.25 0-1.0 R.F. Amp.	4.15

CONDENSERS—OIL FILLED

.5 mfd 2000v DCW	1.85
1 mfd 2000v DCW	2.75
4 mfd 2000v DCW	2.95
15 mfd 2000v DCW	3.75
0.012 mfd 25000v DCW	3.75

TRANSFORMERS 115V AC, 50-60 CYCLES

Plate transformer scope Sec. #1 680v CT @ 225MA., Sec. #2 1340v @ 20 MA.	\$4.85
Filament Trans. 6.4v @ 6.5 amps. (Hi Volt)	2.85
Filament Trans. 7v @ 1.5 amp. (Hi Volt)	1.95
15,000v Insul. Sec. #2 27.1 @ 4.5A, Sec. #2 5.2v @ 5A (CT); Sec. #3 6.5v @ 3A, Sec. #4 5.2v @ 3A (CT); Sec. #5 2.6v @ 3.5A	3.95

CONDENSERS—BATHTUBS—MICA

2X .1 mfd 600v Bath	1.25
3X .1 mfd 600v Bath	1.25
.005 mfd 3000v DCW Mica	1.35
.03 mfd 600v DCW Mica	1.35
1 mfd 600v Bath	1.35
2 mfd 600v Bath	1.35
.0008 mfd 5000v DCW Mica	1.35
.004 mfd 600v DCW Mica	1.35

RELAYS

Dunco 115v AC 60 cycle coil 115v AC 30 amp.	\$2.75
Dunco 125v DC V coil 125v DC 3 amp contacts	2.15
Dunco 115v AC, 30 amps, V coil, 3 amp.	2.15
G.E. 115v AC contacts 50/20 A coil 10v DC	1.35
Allied control 28v DC Dpdt.	.55

"JAN" TUBES—WHILE THEY LAST—GUARANTEED

705A \$2.25	713A \$1.90	806 \$1.90	5HP4 \$2.95
715A .25	717A .90	5U4 .50	
708A .90	2X2 .60		

DYNAMOTORS (NEW—USED)

14v Input @ 3A 220 or 250 output DC	\$2.00
14v Input @ 3.3A 230v @ 100A output DC	2.00
24v Input @ 12.5A 300v DC @ .260A output DC	2.00
28v Input @ 10A	2.00
28v @ 1.6A output 230v DC	2.00

MISCELLANEOUS

#29 Magnet wire wound in layers on spools, approx. 7 lb. wire each spool	\$1.75
Fuses 1/2, 1 & 6 amp, type 3Ag-5Ag, 25 for	1.00
Motors, Hedin 115v AC 60 cyc 1/50 HP, 1725 RPM W or W/O Gear Box	6.95
G.E. Term Board 12 dual contacts W/cover	.25
G.E. Term Board 6 dual contacts W/cover	.15
Trans output PP 616's into 30 ohm load imp ratio 15,000:50	.95
Rheostat IRC—Ohmite 500 ohm 50W	.65
Rheostat IRC—Ohmite 3000 ohm 100W	.85
Toggle Switch Bat handle DPST, SPST, each	.23
Weston Precision Resistor 1.5 KV, 1.5 meg	.95
Power Resistor, Vitreous Type 300, 8000, 11,500 ohm 25W	.35
Porcelain coil forms 2" dia 5" high	.30

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**BROADCASTS THRU YOUR RADIO
WITHOUT WIRE**

Without wires, lets you broadcast through your own radio. Simply turn on radio and tune to any clear channel between 1250 and 1700 KC, talk into the mike and you'll hear through your own radio up to 75 feet away.



COMPLETELY SELF-CONTAINED

Comes complete in one unit, including tube, batteries, etc. Can be used with any radio set. No hook-ups or connections needed. Ideal for gatherings, parties, home recordings, etc. The ideal "baby sitter." Enjoy the high-fidelity, realistic, studio effect that MICRO-VOX produces.

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\$5.95
COMPLETE

ORDER TODAY—SEND NO MONEY

Just send your name and address to the address below and we'll ship you your MICRO-VOX C.O.D. PLUS postage. Or send us \$6.00 and we ship postpaid. Don't delay—Order today.

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Chicago, Illinois

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KAYLINE SERVES THE RESEARCH LABORATORY, INDUSTRIAL USER AND AMATEUR



WAVEMETER

Here's an amazing value on Wavemeters which tune from 150-210 mc and contain high quality resonant cavity wavemeter oscillator heterodyne amplifier electric tuning eye complete with 19 tubes, 110 v AC power supply. The tubes alone far exceed the entire price..... **14.95**

RADAR RECEIVER

A "hot" receiver covering the 174 to 210 MC Television band. Has individually slug tuned antenna R.F., Detector and oscillator circuits resulting in maximum sensitivity; contains 2 F.F. and 5 I.F. stages detector and video amplifier. Complete with 110 volt AC power supply and 14 tubes..... **29.95**



TRANSMITTER

BC-1072-A—An outstanding Kayline value.

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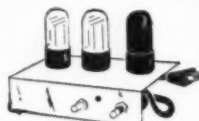
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Mobile Station (Continued from page 43)

values, the oscillator was tuned first with the aid of a receiver with accurate calibrations and a sensitive wavemeter. (The popular type wavemeter using crystal diode and 0-1 ma. meter will give good indication on oscillator output voltage.) Starting with the oscillator coil slug clear out, it was gradually turned in until the oscillator frequency reached 25,400 (27,000 minus 1600) kc., with C_1 and C_2 at full capacity. With the tuning condensers set at minimum capacity, the oscillator should now tune to about 28,400 (30,000 minus 1600) kc. If such is not the case, it will be necessary to adjust the oscillator padder slightly and readjust the tuning slug. Of course if a different tuning condenser is used, having different maximum and minimum capacities, it may be impossible to get the same tuning range. A condenser having a range of about 10 μ fd. from minimum to maximum capacity will just cover the 10 and 11 meter bands nicely. The next step was to connect the output of L_2 into a broadcast receiver tuned to 1600 kc., then adjust C_2 for maximum tube hiss. With the converter operating in this manner, the slug in L_1 was adjusted to give maximum signal strength on 10-meter signals. Slight adjustment of the mixer padding condenser might be necessary for different lengths of receiving antennas. Use of a wavemeter in adjusting the oscillator is advised, as otherwise it may be difficult to determine the fundamental frequency of the oscillator. It is also recommended that the transmitting antenna be used for receiving, as more gain is available if the antenna is resonant for the band.

Before construction was begun on the transmitter, the converter was installed in the car and given a workout. The usual ignition, generator, and other noises were encountered and tracked down. Ignition noise was effectively eliminated by installing spark plug suppressors and by incorporating a simple noise limiter in the broadcast receiver. There are a number of circuits available for noise limiting. However, the most practical and simple involve the use of crystal or tube diodes such as the 1N34 or 6H6 in shunt or series-type limiters. In the case of the writer's automobile receiver, a Chrysler-Philco radio installed in a 1941 Plymouth, the original second detector tube (7B6) was replaced with a 7X7 tube which contains a diode-triode section and an additional diode-cathode section which is being used as a shunt-type limiter. Full a.v.c. voltage is applied to the anode of the limiter through a 1 megohm resistor, while the limiter cathode is tapped down about 20% on the detector diode load resistance. The anode is bypassed to ground by a .05 μ fd. condenser. Normally, therefore,

the anode of the limiter is negatively charged with respect to the cathode, thus preventing conduction. However, sharp noise pulses of short duration, such as ignition noise, but of an amplitude sufficient to drive the limiter cathode negative with respect to the anode, are shorted to ground. The high RC time constant in the a.v.c. circuit to the limiter anode prevents sharp pulses from changing the a.v.c. bias. This noise limiter works very effectively for the writer, automatically cutting ignition noise down to the level of the received signal, and yet producing no distortion or change of level or audio frequency response of the signal. A 1N34 crystal diode was tried in the same circuit first, but it appeared to have the above-mentioned effects on the signal. The tube limiter works much better in this particular case. The 7X7 can be used to replace the 7B6 with only one or two socket changes and the addition of two resistors and one condenser. If the car radio is equipped with other second detector tubes, it will probably be necessary to change the socket or make other arrangements, such as incorporating an additional tube as a noise limiter. Most car radios are pretty crowded, but there should be room to slip in a miniature 6AL5 diode tube.

Outside of ignition noise, the other most commonly experienced noise originates in the generator. It will probably be found, as it was in the writer's case, that the usual 0.5 μ fd. condenser across the output of the generator is ineffective at high frequencies. A very good filter for this type of noise consists of an r.f. tuned filter in series with the output lead of the generator. Specifically, this filter can be constructed as follows: Wind a coil having an inductance of about 1 micronhenry. This coil can be made up with 10 turns of heavy wire (No. 10 or larger to carry the generator output current) with a length and diameter of 1 inch. Connect a mica trimmer of the 3-30 μ fd. variety across this coil. This parallel resonant circuit is placed in series with the generator output lead and tuned for maximum rejection of generator whine. If the car body is loose, it may be necessary to bond major panels together with flexible braid. Of course it may be expected that the specific treatment for each individual automobile will be different, therefore no further noise-suppressing discussion will be necessary.

Total cost of the converter was about \$10, and this sum represents a considerable saving over factory-built converters, making it well worthwhile constructing your own. The gain of this one-tube circuit is remarkable, and it stacks up very well against converters using 3-tube circuits. In fact, considering the normal amount of noise encountered when operating with the station in motion, the 1-tube will pull in anything that can be heard on any 10-meter receiver. The operator who likes to park on top of a hill

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136B1	W W	5,000
.063	W W	20,000
.187B1	W W	3,000
.N2107	W W	100
.155B1	W W	15,000
.105	W W	20,000
.N10B1	Carbon 200,200 dual	2
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away from all interference will be pleased with the way he can hear the DX roll in. Due to the intermediate frequency of the converter, no images are encountered.

The second article of this series will cover the transmitter used with this converter to complete a low-cost mobile station. Actual cost of the writer's transmitter was about \$25, thus making the total cost of the complete mobile station in the vicinity of \$35. The only two major pieces of surplus equipment necessary to make this low cost possible are the transmitter dynamotor and microphone. All other parts are standard.

(To be continued)

Microwave Relays

(Continued from page 38)

and 7000 megacycles. The signal-to-noise power varies between 37.6 and 45.7 db. along the route. It has been found that due to the substantial distances between relay points for the available elevations, some grazing at the horizon takes place during the summer months when trees are in full foliage. This may manifest itself in a less optimum communication path. The transmission from the New York terminus to the first repeater-booster station of the Philco portion of the system is as follows:

1. The video input operates the repeaters of two Type 2K28 reflex klystron tubes.

2. These tubes are connected to cavities and are tuned 115 megacycles apart when not undergoing change due to modulation. Under modulation they swing apart as much as 125 megacycles. The output of these two 2K28 tubes without modulation is 3235 and 3350 megacycles. The intermediate frequency fed through a crystal comes out at low level. It is boosted through a type 832 and a type 829 i.f. amplifier stage before being fed into a type 2C39 disc seal tube in a cavity. This tube is an r.f. mixer. Feeding into it are a 2C39 heat-compensated oscillator and a 2C39 buffer, each with its own cavity. The high side of the mixed frequency is at 1370 megacycles which is fed to the 4-foot parabolic antenna reflector via a coaxial cable. The antenna gain is approximately 20 db. or 100 times at each station. The receiver is a superheterodyne employing a reflex klystron local oscillator and a crystal converter.

The General Electric microwave relay system from New York to Schenectady, N.Y. is a simplified one-way radio network for relaying WNBC Channel 4 program material so that it may be retransmitted at Schenectady to local television receivers. The program is received by direct broadcast on a television receiver atop the General Electric building in New York City and fed into the microwave transmitter. The video signals are fed into a three stage preamplifier followed by a 6AG7 amplifier, 6L6 amplifier, 4D32

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15' length RGN coax. cable with connector on each end \$0.69
300 Ohm moulded line per 100 feet 2.75



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RADIO & TELEVISION NEWS

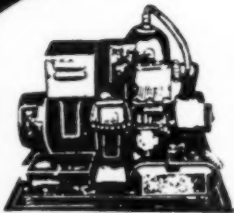
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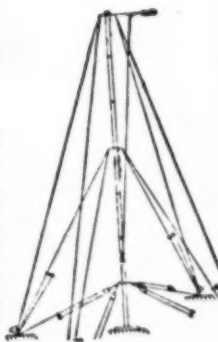
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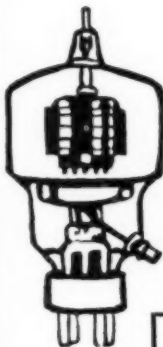
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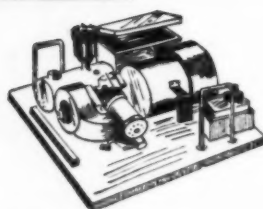
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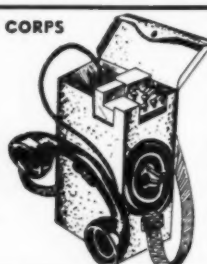


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12 v vibrators, 300 v @ 100 ma natl. adv..... **3.95**
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Sound Powered Phones TS-10-G..... **27.95**
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amplifier, 6SL7 d.c. insertion for the klystron, 1616 final modulator tube and thence modulating the repeller of a type SRL7 reflex klystron in the 2000 megacycle region. The accompanying sound is fed by landline direct to Schenectady. The relay system comprises intermediate repeater-booster points at Beacon, Roundtop, and Heldeberg in New York state.

Fig. 1 shows the new microwave research tower of the *Federal Telecommunication Laboratories* at Nutley, N.J. Mounted on the tower are experimental parabolic reflectors for operation with a variety of microwave communications and relay equipment of their manufacture. For the 900 megacycle region, they employ a 6 foot dish reflector with a gain of 26 db. For 2000 megacycles, they employ a 10 foot dish reflector with a gain of 36 db. At 5000 megacycles, they achieve a gain of 42 db. with the same 10 foot dish reflector. They are employing a type SRL17 klystron on 900 megacycles, a 2C43 disc-seal tube on 2000 megacycles, and a choice of klystrons for higher frequencies. They have specialized particularly in the development of microwave communication and relay equipment employing pulse time modulation principles to provide large numbers of simultaneous communication channels.

Fig. 5 shows the locations and tower elevations for the so-called "New York-Washington-Pittsburgh triangle" of the *Western Union* microwave relay system. The equipment was originally designed and manufactured by the *Radio Corporation of America* with continued production being undertaken by the *Philco Corporation*. The system may accommodate two television relay channels even though primarily intended for up to 270 quadruplex communications channels. The results to date have been sufficiently promising to justify the next stage of expansion towards Chicago.

Fig. 4 shows microwave radio field tests actually underway between Chicago and Milwaukee, Wisconsin. This is a \$500,000 program financed by the *Illinois Bell Telephone Company* and the *American Telephone and Telegraph Company's* Long Lines department.

Fig. 6 shows transmitting and metal lens antenna horn equipment used for relaying television from the Hollywood, California studio to the television transmitter located on Mt. Wilson. A landline is used for transmitting the accompanying sound.

Fig. 7 shows experimental transmitting and receiving antennas, with their associated reflector systems for energy concentration, at the New York terminus of the *Raytheon* network. This system extends from Waltham, Massachusetts to New York City. It is still highly experimental and is currently inoperative while undergoing further consideration as to commercial application.

Interesting observations have been

RADIO & TELEVISION NEWS

made in the course of microwave experiences to date. Summer conditions are the most erratic. For example, the Bell System experiences violent and fast fades at times between midnight and about 3:30 a.m. in summer although this phenomenon was absent during the remainder of the year. Reception is stable for fluctuations up to 20 db. because of suitable a.v.c. provisions.

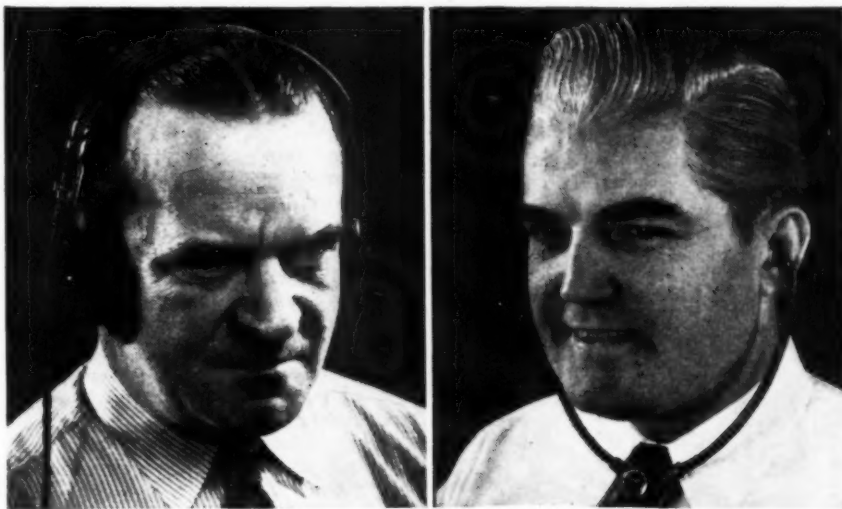
The cost of microwave stations can be much lower, the bandpass for equivalent booster station distance separations much greater, and the attenuation much less than for coaxial cable. Where microwave relay systems represent little or no economy with respect to coaxial cables, it is only a temporary condition resulting from elaborate expenditures—in some cases for model housing, long paved access roads, the use of only one channel of communications where several could be handled with the same layout, etc. The general expectation is that microwaves will be very much less costly than coaxial cables for the handling of wide-band transmissions as required for television or multi-channel communications. The author is indebted to all the organizations listed for their complete cooperation in permitting an inspection and understanding of the facilities described during the summer of 1948. Everyone feels that although microwaves work satisfactorily and are here to stay in ever-expanding application, equipment and tubes for the application are capable of much greater development and improvement. This is constantly taking place in government, industry and among research laboratories. The needs and possibilities exist to the extent that the wherewithal is being made increasingly available.

NOTE: This article is based on a long and continuous survey on the communications and relay aspects of microwaves made on behalf of the microwave component firm of DeMornay Budd Inc. It culminated in a three-week, full-time study of existing systems and applications during the period July 6th to July 23rd inclusive. The author conducted this survey with the cooperation of all of the organizations involved and has compiled this special report for the readers of RADIO & TELEVISION NEWS. —30—



November, 1948

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First basic improvement in headset design in 50 years

TELEX MONOSET

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- Ends headachy ear pressure

Man, what relief to get rid of those pressure headaches from old-style earphones!

The TELEX MONOSET swings lightly under the chin like a stethoscope—never gets in your hair! The TELEX MONOSET delivers the signal into the ears, excludes all room noise automatically. The TELEX MONOSET gives undistorted output at maximum volume... plenty of "sock" easily adjusted with the built-in volume control.

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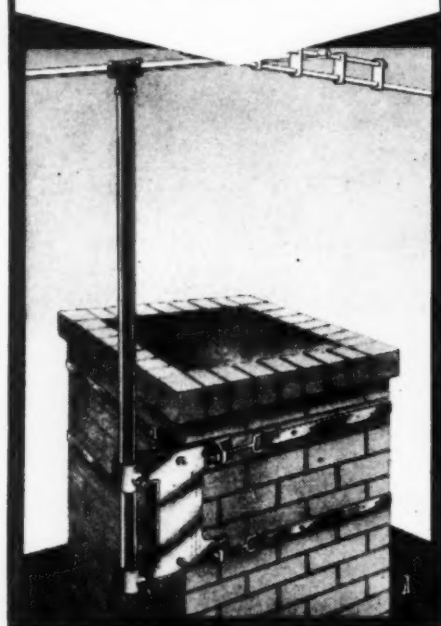
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Chimney Mount is by far the fastest selling product of its type in the radio and television fields. It can be installed in ten minutes without the use of special tools or drilling of holes. Several mounts can be strapped to one chimney—to pole, 2 x 4, side of house or to any rectangular roof extension. Fastens aerial to highest point with galvanized steel bands having a combined tensile strength of more than 3,000 lbs. Made of corrosion-resistant aircraft-type aluminum alloy. Weight: 3 lbs.

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South River Metal Products Co.
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Stop That Pedestrian

(Continued from page 67)

and Watch Radar." Upon touching the window (the plate being inside) at that point, a model train starts running and stops upon removal of the hand. Now who doesn't like to watch a toy train run!!! When placed low enough for Junior to operate, Mamma has a deuce of a time removing Junior from the scene. A toy electric train is the most effective object that can be employed.

Many ideas and devices were tried at the *Ideal Radio & Appliance Store*, and as can be seen the variations and combinations of the three basic "crowd stoppers" are numerous and depend solely upon the ingenuity of the store operator.

Other stores, in other trades, may often request rental or sale of your "crowd stopper" equipment. This can be a very profitable sideline as when a capacity relay is used, the operated device (toy train, horn gap, etc.) may be varied weekly to provide a new entertainment for some time.

The capacity operated relay shown on the schematic is very simple to build and adjust. It is not the most sensitive type, but it is very inexpensive to build. A 60 volt d.c., 1500 ohm power relay is used in the 0A4 tube plate circuit to directly control 110 volts up to 10 ampere load. The condenser across the relay is to prevent chatter, while the series resistor is to prevent excessive peak current through the 0A4. Radio frequency applied to the 0A4 starter grid keeps the 0A4 tube "fired" and the relay closed. Thus the NC contacts (now NO) are used to turn on power. This r.f. is supplied by a e.c.o. type oscillator. The grid leak condenser of the oscillator is made variable. A thin wire runs from the grid to the "detector plate." Now the grid leak condenser may be adjusted so that the oscillator is barely oscillating, in which case anybody approaching the detector plate loads up the oscillator enough to cause it to drop out of oscillation. In this particular circuit this causes the 0A4

to extinguish and the relay opening closes the NC contacts. Of course the circuit may be modified; the r.f. may be rectified and supplied as negative bias to a power tube thus holding the plate current off until r.f. failure. Practically no power supply filtering is necessary. The coil used may be a standard broadcast r.f. coil, in which case no tank condenser is used. This is done in order to place the oscillation at a high frequency, above the broadcast band so as to not interfere with local reception and broadcast receiver demonstration. Needless to say the r.f. radiation should be well below FCC requirements. With flea power at 1500-30,000 kc. it is not too bad.

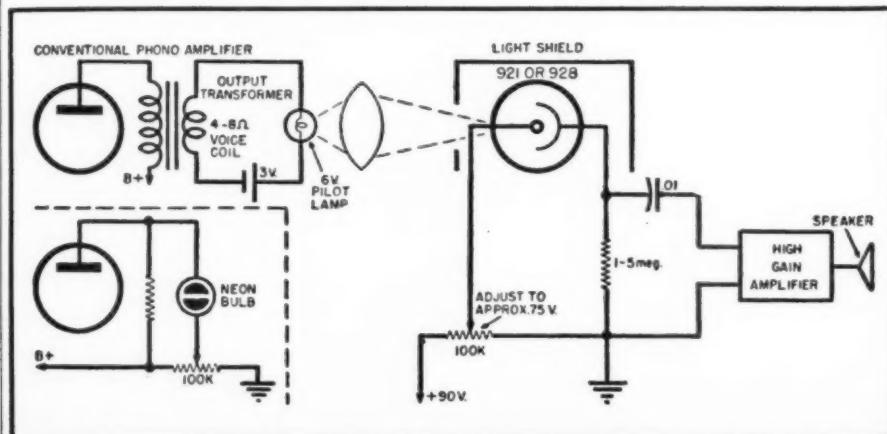
Sound equipment may be used in conjunction with a capacity relay. Where it is not practical to have the light beam (of a sound-over-light) go out through the window, a capacity relay operating a fan or paddle may be used to break up the audio.

Sound over a light beam requires very little equipment. A standard automatic phonograph is connected, as shown in the diagram of Fig. 3, voice coil-to-lamp. At the photocell end a good amplifier will be required. This can be a small phono-amplifier whose output is fed into the phono attachment on a large receiver. It is important that the voltage on the photocell be adjusted close to the correct point. Excess in either direction will cause loss of gain. Excessive high voltage will cause a gas filled tube to ionize and can damage it severely. Care must be taken to keep sunlight, tungsten, or fluorescent light out of the photocell. A hood is recommended. A 120 cycle hum due to stray tungsten or fluorescent light falling on the photocell may be reduced by lowering the first few coupling condensers in the amplifier to .00005 to .0001 values so as to attenuate the low frequency response of the amplifier. The light beam required for this system is small for a ten foot throw, any 1/4 to 1/2 watt neon or any 6-8 volt pilot light is satisfactory for the light source.

This article can but point the way to "Stop That Pedestrian," you, the reader, can employ variations to fit the times and your store.

-30-

Fig. 3. Setup used to produce "sound on a light beam" effect.



SCR 610 11-10 METER PORTABLE/MOBILE RIG

SCR 610 portable transmitter-receiver, 27 to 38.9 mc. crystal controlled, using FM for efficient operation. Unit consists of Xmitr-rxcr BC 659 and power supply PE 97 operating from 6 or 12 vdc. Slightly used, excellent condition. Less X'tals, Antenna, Handset.....\$25.00

QBG-1, ECHO RANGING DRIVER-RECEIVER

Complete underwater sound signal transmission and reception unit with range of 200 to 600 yds. and freq. range of 16 to 27 kc. New, complete with battery box in leather chest, less projector.....\$85.00

CONSOLE PANEL SB-19/GT

Supervisor-operator panel: consists of jack and key panels, relays, and line terminating facilities. Used originally to monitor and patch up telephone lines in plotting shelter, and to switch outside telephone lines. Size: 60" x 28" x 18". New, export packed.....\$350.00

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Extends range of field telephone apparatus, such as EE-8 up to 25 miles, when inserted in a line. New with spare tube and instruction manual, less standard type batteries.....\$21.50

BC 686 LINE AMPLIFIER

With magnet ringer, 3-tube 25L amplifier. For local point-to-point telephone operation, remote operation of phone Xmitr, remote reception of receiver output, monitoring facility. Requires only 24VDC for Tube B plus for full operation. New, less tubes, in wooden chest.....\$18.50 Per pair for 2-way pt-to-pt operation.....\$35.00

FEDERAL F.T.&R 101-A TWO WIRE APPLIQUE

Provides necessary balancing facilities for four-wire repeater when used on two-wire lines which may be voice-frequency telephone lines of open wire, or non-loaded or loaded cable. Std. 10" channel iron rack mtg. Price, new, complete with tech. manual.....\$54.00

GREAT TUBE VALUES

01-A	\$.45	5J30	\$39.50	530	\$90.00	1624	\$.85
1B24	4.85	6AC7	1.00	531	45.00	1629	.35
1H5	.35	6AK5	.95	532	3.95	1961	5.00
1N5	.69	6C4	.58	559	4.00	8012	3.95
1P4	.69	6C6	2.00	562	90.00	9002	.65
2C21	.69	6J6	1.00	515	.40	9004	.47
2C22	.69	6K7	.55	703-A	7.00	9006	.47
2J21-A	25.00	6L6GA	1.00	704-A	.75	CEQ 72	1.95
2J22	15.00	6SC7	.70	705-A	2.85	EF 50	.79
2J26	15.00	6SL7	1.00	707-B	20.00	E-1148	.75
2J27	15.00	6V6	.75	714AY	15.00	F-127	20.00
2J31	25.00	7C4	1.00	715-B	12.00	PC 258A	
2J32	15.00	7E5	1.00	720BY	50.00		165.00
2J38	25.00	7E6	.72	720CY	50.00	PC 271	40.00
2J39	25.00	10Y	.60	721-A	3.60	GL 562	75.00
2J55	25.00	12A6	.35	723-A/B		GL 623	75.00
3C1	35.00	12CP7	14.95		12.50	GL 697	75.00
3C2/870	.69	12KX7	.63	724B	1.75	ML 100	60.00
3A4	.69	12SF7	.49	724-D	2.50	QK 59	55.00
3BP1	2.25	12SH7	.72	725-A	25.00	QK 60	55.00
3C24	.60	15R	1.40	726-A	15.00	QK 61	55.00
3C30	.70	28P7	.75	800	2.25	QK 62	55.00
3D6	.79	30 Spec.	.70	801-A	1.10	"RCA932	.65
3CP1/813.50	351.6	.69	804	9.95	VR 61	1.00	
3D21-A	1.50	35Z5	.66	815	2.50	VR 130	1.25
3DP1	2.25	45 (Spec.)	.59	836	1.15	VR 135	1.25
3EP1	2.95	50L6	.79	837	1.95	VR 137	1.25
3PT7	1.20	39/44	.49	843	.59	VR 150-30.95	
3CP1	3.50	35/51	.72	860	15.00	VR 120	1.00
3Q5	.79	21T	.75	861	40.00	VT 134	1.00
5RP1	1.20	22TA	3.85	874	1.95	WT 532	4.75
5RP4	4.95	22S	8.80	876	4.95	WN 150	3.00
5CP1	3.75	26R-A	20.00	1005	.35	WT 260	5.00
5PT7	3.50	35S-A	19.50	1613	.50	twelfth cavity	
5J12	8.00	41TA	22.50	1619	.21		5.00

COAX CABLE

RG 18/U, 52 ohm imp. armored.....\$0.51/ft.
EG 24/U, twin coax, 125 ohm imp. armored.....\$0.50/ft.
RG 28/U, 50 ohm imp. pulse cable. Corona min. starting voltage, 17 KV.....\$0.50/ft.
RG 35/U, 70 ohm, imp. armored.....\$0.50/ft.

COAX CONNECTORS

831R	.....\$0.35	UG 21/U	.....\$0.85
831SP	......35	UG 86/U	......95
831AP	......35	UG 254/U	......75
831HP	......15	UG 255/U	......85
Hemmed male to type "N" male adapter	.....1.25		
RT ANGLE Sperry fittings	.....1.00		

BAND PASS FILTER

#70473. Sharp band pass peaked at 700 cps. Bandwidth: 650 cycles at 20 db. Down from peak. High-to-high impedance. Can be plugged into phone output of receiver for good results. Cuts out QRM New, with circuit diagram.....\$2.25



VOLTAGE REGULATORS



Mfg. Raytheon: Navy CRP-301407; Pri: 92-138 v. 15 amps, 57 to 63 cy. 1 phase. Sec: 115 v. 7.15 amp. .82 KVA, 96-PF. Contains the following components:

Regulator Transformer; Raytheon UN-9545. Pri: 92-138 v. 60 cy. 1 PH. Sec: 200-580 v. 5.5/5.26 amps, 4000 v rms test. Filter Reactor: 150 hy. 5 amps, 4000 v test, Raytheon UX 9547.

Transformer: Pri: 186 v. 5 amps; Sec: 115 v. 7.2 amps. Size: 12" x 20" x 29". Net wt. approx. 250 lbs. Entire unit is enclosed in grey metal cabinet with mounting facilities. New, as shown.....\$99.50

TRANSFORMERS

W.E. #K8 9668: Pri: 115 v. 60 cy. 18 amp. Sec: 2750/2470/2240 v. 750 ma. NCT 7 KV insulation. \$34.50
STEP DOWN TRANSFORMER: Pri: 440/220/110 volts a.c. 60 cycles, 3 KVA. Sec: 115 v. 2500 volt insulation. Size: 12" x 12" x 4" Aeromax.....\$10.00
PLATE TRANSFORMER: Pri: 117 v. 60 cy. Sec: 17,000 v. @ 144 ma. with choke. Oil immersed. Size 26" x 20" x 13". Amertran.....\$65.00
Fil. Transformer: Pri: 220 v.a.c., 60 cy.; .05 KVA. Sec: 5 v.c.t., 34,000 v. test.....\$24.50
Fil. Trans. UX-6899. Pri: 115 v. 60 cy. Sec: Two 5 v. 5.5 Amp. Wides. 20KV test.....\$24.50
Plate Transformer: Pri: 115/230 v.a.c., 50-60 cy. Sec: 21,000 v. 100 ma.....\$120.00

OIL CONDENSERS

.1 mfd. 10 KVDC GEPRY #14F191.....\$15.00
.06 mfd. 15 KVDC GEPRY 25F85-62.....8.70
1.5 mfd. 6000 vdc Aeromax.....10.50
.25 mfd. 20,000 vdc.....17.50
10 mfd. 1000 VDC.....1.79
3x10 mfd. delta connected synchro-capacitor, 90 v. 60 cycles, GE.....4.95
1 mfd. 6000 vdc, GEPRY 25F50092.....3.85

POWER CHOKES

Swing Choke: 4.5 .110 hy. 15 amp.....\$ 4.50
to .8 hy: 2 to .61 hy. 2.5 amp.....1.50
1 amp.....\$10.95
.03 hy. 2 amp.....1.45
8.5 hy. 125 ma.....1.50
25 hy. 65 ma.....1.10
6 hy. 150 ma.....1.10
Dual 7 hy. 75 ma.....1.10
hy. 60 ma.....1.65
Dual 2 hy. 100 ma......75



11.5 KVA TRANSTATS (AMERTRAN)

Input: 0-115 v. 50-60 cycle. Maximum output: 115 v. 100 amp. All units are new, guaranteed.....\$75.00 Each

400 CYCLE TRANSFORMERS

Pri: 115 v. 400 cy. Sec: 6.3 v. 2.7 amp; 6.3 v. .60 amp; 6.3 v. 21 amp.....\$2.95
32332: Pri: 115 v. 400-2400 cy. Sec: 400 vet, 35 ma; 6.4 v. 2.5 amp; 6.4 v. .15 amp.....\$2.25
32323: Pri: 115 v. 400-2400 cy. Sec: 6.3 v. 12 amp; 6.3 v. 250 v. 100 ma; 5 v. 2 amp.....\$3.50
#9069: Pri: 115/80 v. 400-2600 cy. Sec: 650 vet, 50 ma; 6.3 vet, 2 amp; 5 vet, 2 amp.....\$2.15
352-7096: Pri: 115/80 v. 400-2400 cy. Sec: 2.5 v. 1.75 amp, 3KV ins; 5 v. 3 amp; 6.5 v. 6.5 amp; 6.5 v. 1.2 amp.....\$8.95
KS 9005: Pri: 115 v. 400-2400 cy. Sec: 734 vet, 177 ma, 1710 vet, 177 ma.....\$5.95
D-166333: Pri: 115 v. 400-2400 cy. Sec: 6.3 v. 0.9 amp, 7.7 v. 0.365 amp.....\$2.79
GE #7471957: Pri: 100/110/120/130 v. 400-2400 cy. Sec: 2.5 v. 20 amp, HV ins.....\$4.85
D-166334: Pri: 115 v. 400 cy. Sec: 6.3 v. 12 amp; 6.3 v. 2 amp; 6.3 v. 1 amp. P.O. AN/APQ-5.....\$5.85
KS 9085: Pri: 115 v. 400-2400 cy. Sec: 6.4 vet, 7.5 amp; 6.4 v. 3.8 amp; 6.4 v. 2.5 amp.....\$4.35
PLATE XFMR: Pri: 115 v. 400 cy. Sec: 9800 v or 8000 v @ 32 ma dc.....\$12.50
#12053, Plate Xfmr: Pri: 115 v. 800 cy. Sec: 455 v. 250 ma.....\$7.50
KS 9445, Pwr Xfmr: Pri: 115 v. 400-2400 cy. Sec: 502 vet, 120 ma, 6.3 v. 8 amp; 5 v. 2 amp.....\$3.50
PLATE XFMR: Pri: 115 v. 400-2400 cy. Sec: 4500 v. 6 ma.....\$6.50
#7143: Pri: 115 v. 400 cy. Sec: 6.3 v. 7 amp, 8.3 v. 8.8 amp; 6.3 v. 1.3 amp.....\$2.50
FIL XFMR: Pri: 115 v. 400 cy. Sec: 6.3 v. 9 amp; 6.3 vet, .65 amp; 2.5 v. 3.5 amp; 2.5 v. 3.5 amp.....\$3.25
KS 9584, Pri: 115 v. 400 cy. Sec: 5,000 v. 290 ma; 5 v. 10 amp; size: 7"x10"x6".....\$15.00
Pri: 115 v. 380-2800 cps. Sec: 2200 v. 350-VA, open frame.....\$17.50
PLATE XFMR: Pri: 115 v. 400 cy. Sec: 1150-0-1150 v. 40 ma, GE, 68G831.....\$1.75

INVERTERS

PE 206-A: Input: 28 VDC @ 38 amp, Output: 80 volts @ 500 volt-amps, 800 cycles, Leland. New, complete with enclosed relay, filter, instruction book.....\$12.50
PE 218: Input: 25-28 VDC @ 92 amps, Output: 110 volts @ 1500 volt-amps, 380-500 cycles, Used: \$15.00 New: \$45.00.

XMTR TUNING UNITS

From BC 375: TU-9 (7.7-10 mc); TU-10 (10-12.5 mc); TU-22 (350-650 kc); TU-26 (200-500 kc). Each.....\$2.75
For BC 610: TU 48 (2.5-3 mc); TU 47 (2-2.5 mc); TU 53 (8-12 mc). Each.....\$1.75
For BC 223AX: TU 17 (2-3 mc); TU 18 (3-4.5 mc). Each.....\$1.95

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Complete set for the erection of a full flat top antenna. Of rugged plywood construction telescoping into 3 ten-foot sections for easy storage and transportation. A perfect set-up for getting out. Supplied complete: 2 complete masts, hardware, shipping crate, Shipping wt. approx. 300 lbs. Sig Corps #2A280-223-A. New.....\$39.50 per set of 2

MAGNETRONS

TUBE	FREQ.	PWR. OUT.	PRICE
2J31	2820-2860 mc.	265 KW.	\$15.00
2J21-A	9345-9405 mc.	50 KW.	25.00
2J22	3267-3333 mc.	265 KW.	15.00
2J26	2802-3019 mc.	275 KW.	15.00
2J27	2805-2892 mc.	275 KW.	15.00
2J32	2780-2820 mc.	285 KW.	15.00
2J38 Pkg.	3240-3263 mc.	5 KW.	25.00
2J39 Pkg.	3267-3333 mc.	8.7 KW.	25.00
2J55 Pkg.	9345-9405 mc.	50 KW.	25.00
3J31	24,000 mc.	50 KW.	35.00
714AY			15.00
720HY	2800 mc.	1000 KW.	50.00
720CY			50.00
725-A			25.00
730-A			25.00

Klystrons: 723A/B.....\$12.50
707B (w/cav.).....20.00
720-A.....15.00

MAGNETS

For 2J21, 725-A, 2J22, 2J26, 2J27, 2J31, 2J32 and 3J31.....Each \$8.00
4850 Gauss, 1/2" bet. pole faces, 3/4" pole diam.....8.00
1500 Gauss, 1/2" bet. pole faces, 1 1/2" pole diam.....8.00

TUNABLE PKG'D "CW"

MAGNETRONS

QK61.....2975-3200 Mcs QK62.....3150-3375 Mcs
QK60.....2800-3025 Mcs QK59.....2975-3200 Mcs
New.....\$55 each

VARISTORS—W. E.

D-171121	.....\$0.95	D-168549	.....\$0.95
D-171631	......95	D-162482	.....3.00
D-167170	......95	D-99136	.....1.65
D-17022395	D-1662712.50
D-16868795	D-1623561.50
D-17181295	D-16187A2.85
D-17152895	D-999462.00
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THERMISTORS—W. E., \$.95 Ea.

D-167332 (head).....\$1.66
D-170396 (head).....\$1.66
D-167618 (button).....\$1.66

DYNAMOTORS



Type	Input Volts	Input Amps	Output Volts	Output Amps	Radio Set	Price
PE 73	12	10	1000	.350	BC 375	\$24.50N
BD 77KM	14	40	1000	.350	BC 191	20.00N
						14.00LN
DM 21	14	3.3	235	.090	BC 312	3.45LN
DM 21CX	28	1.6	235	.090	BC 312	3.45N
DM 25	12	2.3	250	.050	BC 367	2.40LN
DM 28R	28	2.25	375	.070	BC 348	8.75N
DM 33	28	7	540	.250	BC 456	5.50N
DM 42	14	46	515	.110	SCR 506	6.50LN
						1030 .050
PE 55	12	25	2/8			
PE 66	28	1.25	250	.400	SCR 245	5.25LN
PE 101 C	13/26	12.6/4	400	.135	SCR 515	5.25N
			6.3	.800		
			9	AC 1.12		
BD AR 93	28	3.25	375	.150		4.95N
23350	27	1.75	285	.075	APN-1	5.50N
33X045B	28	1.2	250	.060		3.50N
ZA 0513	12/24	4/2	500	.050		3.95N
B-19 pack	12	9.4	275	.110	Mark II	9.95N
			500	.050		

*N—New. LN—Like New. SELSYNS—115 v. 60 cy. Size 5.....\$7.75 pr.

INSTRUCTION MANUALS

BC 312, BC 342.....	\$1.25
SCR 281.....	\$1.25
ZA Expt.....	1.00
BC 642.....	1.00
1.00 SX 32.....	1.00

VIBRATORS

TR 1210, 12 vdc, 5 pin.....	\$1.20
OAK V-6675, 24-32 vdc, 7 pin.....	1.10
Mal. Type G534C, 12 vdc, 5 pin.....	1.25
Mal. Type G629-C, 12 vdc, 4 pin.....	1.15
Radlaart VR2, 6 v. DC, 6-pin special.....	1.40

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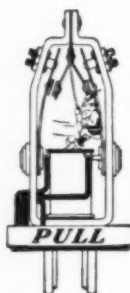
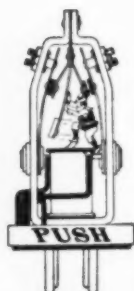
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Note these additional features:

- (1) Uniform accuracy of contact adjustment.
- (2) Angular positioned reed arms (patented)
- (3) Larger magnetic coil—more driving force.

New vibrator replacement guide will bring you up-to-date on vibrator inter-changeability.



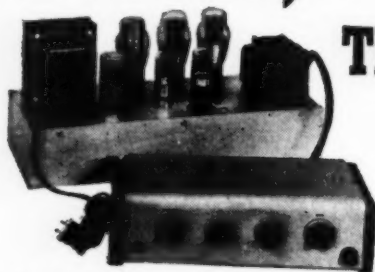
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Introducing...



The NEW Brook 10 WATT All-Triode Amplifier

Model 12A3—Two-unit remote-control amplifier. Decorator-styled control cabinet for living-room use. Also available as Model 12A2 for table or rack operation.

HERE it is at last—an amplifier of incomparable performance—built up to the highest standards of Brook engineering—in the moderate price field.

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The use of low-mu triodes in all stages, together with Brook-designed transformers available in no other amplifier, permits the cleanest amplification ever achieved... with

intermodulation and harmonic distortion reduced to the vanishing point at any power up to maximum. Frequency response is flat within 0.2 DB from 20 to 20,000 cycles.

Now for the first time, the distortion-free all-triode performance which the Brook Amplifier alone provides is available at a new low cost. Orders will be filled as rapidly as production permits.

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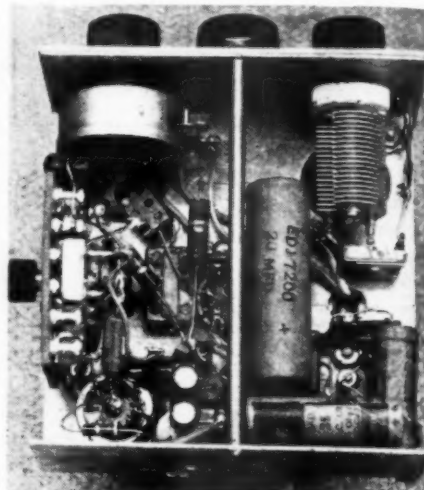
BROOK ELECTRONICS, Inc.,
34 DeHart Place, Elizabeth 2, N. J.

Compact Superhet

(Continued from page 53)

together or spread apart on the form until the proper frequency range is covered and then a heavy coat of coil dope applied to the coil.

On the rear apron of the chassis an insulated jack is mounted for the headphones and a grommited hole is provided for the power supply cable. The receiver is Scotch on power con-



Under chassis view of compact receiver. The b.f.o. pitch control condenser is mounted on a small bakelite terminal strip. The brace under chassis is length of brass tubing tapped at each end to carry machine screw.

sumption; a one amp. filament transformer will supply the heaters with power to spare and any plate voltage from 22½ to 150 volts may be used. At 22½ volts the receiver draws but 3 ma. and at 150 volts the current is 14 ma. At this drain a "B" battery will give almost shelf life. There is not a great deal of increase in headphone volume with the higher plate voltages and the use of voltages over 67½ or 90 volts is hardly justified.

—50—



"The name of the selection now playing is . . . !"

Recording of Sound

(Continued from page 50)

can normally be taken from the power supply of the original equipment.

Figs. 2 thru 13 illustrate the various typical curves obtained with this equalizer with the setting at maximum value.

To permit equalization for a wide variety of applications, the high frequency and low frequency boost sections are arranged for two frequencies each. In most applications the frequency desired is predetermined, and when the unit is wired into the equipment, the appropriate connections are employed. If a wide range of use is anticipated, the 50 cycle and 100 cycle

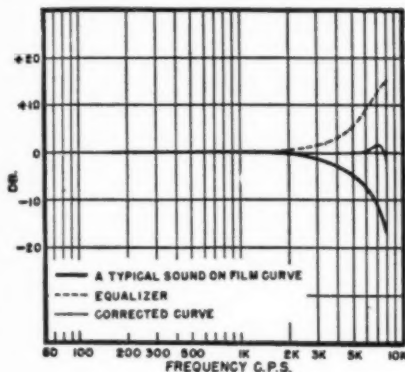


Fig. 9

terminals can be brought out to a single-pole, double-throw switch, and in like manner, the 5 kc. terminals to a similar switch, thus permitting instantaneous changeover to the desired resonant frequency.

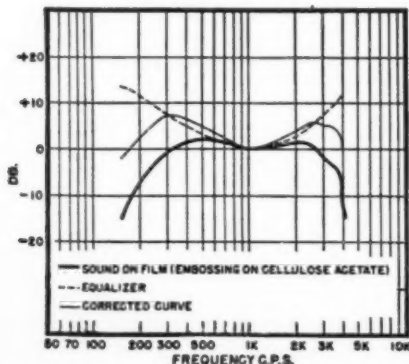
The following considerations should be observed in order to take full advantage of the possibilities of the equalizer:

1. The unit is designed to work between two impedances of 10,000 ohms, and this value of termination must be used to maintain accuracy of calibration.

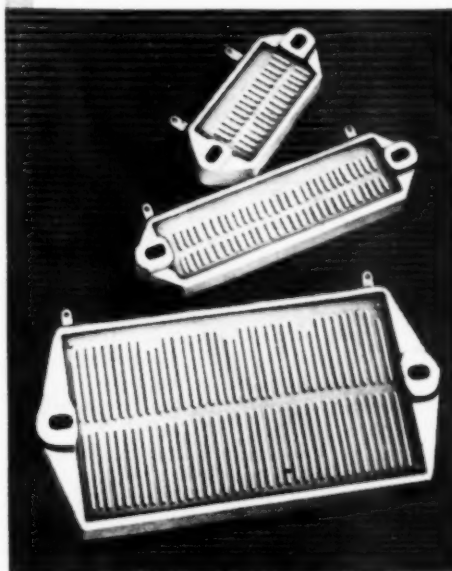
2. No distortion is introduced if the maximum level at the equalizer input is held below 2 volts, with negligible distortion at several times this value. The unit should not be used at signal levels above 10 volts.

3. When adding this type of reso-

Fig. 10



Only **WARD LEONARD** gives you

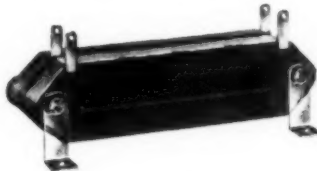


Vitrohm Plaque Resistors

For High
Frequency Circuits

FOR RHOMBIC ANTENAS

For use as a terminating resistor, the 125 watt size is available in 800 ohm, 1600 ohm, and 2400 ohm, for individual use on low power rigs, and parallel or series-parallel networks on high power transmitters.



GANG MOUNTING

Two or more Vitrohm Plaque Resistors may easily be ganged to obtain other desired wattages and resistances. Illustration above shows method of mounting two units together.



SEND FOR HELPFUL CATALOG

Catalog D-130 gives complete data and listings on stock units available in Resistors, Rheostats, and Radio Amateur Relays. Send for your copy today!

These non-inductive Plaque resistors are especially suitable where a combination of power and high frequencies exist. Deep insulating barriers separate non-inductive winding. Special Ward Leonard vitreous enamel—tough, crazeless, acid and moisture resisting—is fused over the base, wire and terminals. Available from stock in 20, 40 and 125 watt sizes, in a wide range of resistance values.

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Type PE94B (for BC 522) (28 V. D.C. to 14.5—150 V.—300 V. D.C.).....\$5.00 EA.

Type DM33A (for 274-N Modulator or ARC/3 with Adaptions) (28 V. D.C. to 550 V. D.C.).....\$1.50 EA.

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Compass Loop (for 433 G, or ARN/7). New. Good. Not kept in dry storage.....\$4.50 EA.

TU5B (new) TU26B (new). Tuning Unit (375E).....\$2.50 EA.

R.F. Section (191) for BC 348Q.....\$2.00 EA.

R.F. Section (MN26) Radio Compass.....\$3.00 EA.

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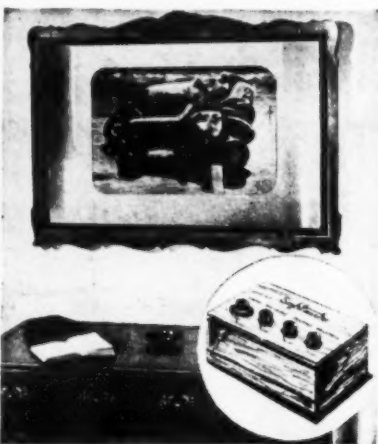
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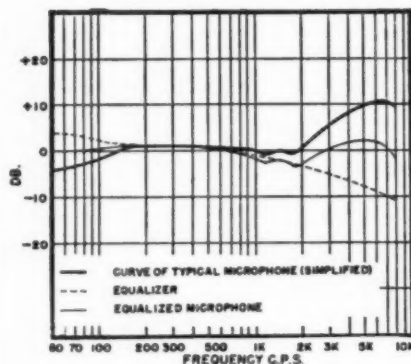


Fig. 11.

nant equalizer to an amplifier with very little reserve voltage gain, a pre-amplifier such as cascaded triodes will result in an output voltage essentially equal to the input voltage when both maximum bass and treble boost are used.

4. When an amplifier incorporating the CGE-1 is run with no boost, the mid-frequency gain is 30 decibels over that with full boost. For best signal-to-noise ratio under these conditions,

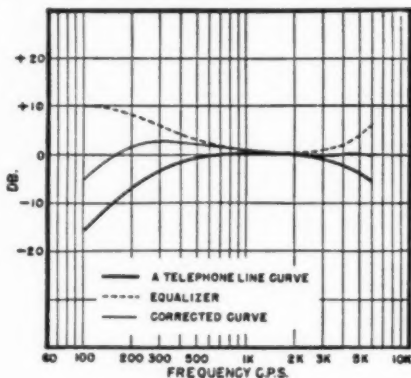


Fig. 12.

a master gain control should be used in the circuit after the equalizer itself.

Another popular commercial tone control system developed by Thordarson engineers is employed in the record-reproduce amplifier (Part 11, of

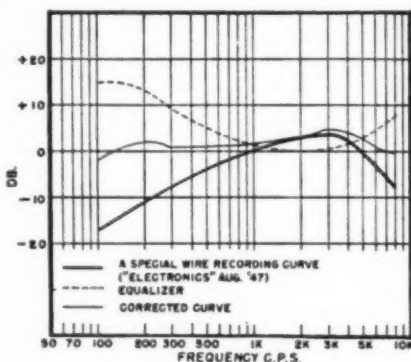


Fig. 13.

this series). It is based on the degeneration in the cathode circuit of a suitable triode amplifier.

REFERENCE:

United Transformer Corp., Bulletin CGE.
(To be continued)

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A Dependable Name in
RADIO TUBES

GT, Glass and Miniature Types
All Tubes in Individual Cartons

6ABGT	12BA6	1T4
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6BE6	12Q7GT	3B4
6K7GT	12SA7	3Q4
6Q7GT	12SK7	3V4
6SA7GT	12SQ7	12AU6
6SK7GT	25L6GT	12BF6
6SQ7GT	25Z6GT	35B5
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6X4	50B5	35Z5GT
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1H5GT	19T8	53
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32L7	84	6L5GA

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SPECIAL! 6BG6G, 89¢

Standard Replacement

VOLUME CONTROLS, All sizes

1 1/2" shaft, less switch, each.....	24¢
With SPST switch, each.....	34¢
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PM SPEAKERS, Less Trans.

4" with Alnico V Magnet.....	\$1.14
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Write for Bargain Catalog N-11

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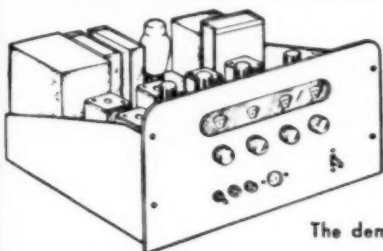
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RADIO & TELEVISION NEWS

Offering Surplus Material of the Highest Utility at the Lowest Competitive Prices.

BC-1068 HIGH FREQUENCY RECEIVER



One of the most useful and adaptable high frequency receivers to ever appear on the surplus market! A red-hot receiver for the amateur 144-148 mc band by a slight retuning of the input circuits. Readily converted to FM operation to cover taxicab, police and fire department frequencies. Also ideal for television and other experimental applications.

14 tubes! Two, RF stages—five, IF stages! IF frequency is approximately 10 mc and can be peaked to 10.7 standard. Has heavy-duty power supply for operation on 110-115 V, 60 cycle, AC. Frequency range, 150-200 mc. Circuit diagram comes with each set.

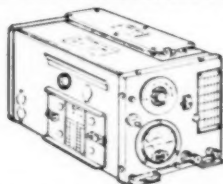
Units offered are slightly used or shelf-worn but are in excellent condition.

The demand will be great—the supply limited—the price is really low-down at.....

\$29⁹⁵

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GF-11 TRANSMITTER

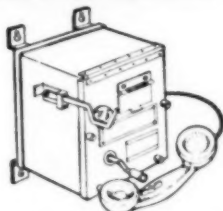


Here's a lovely little transmitter that will deliver a real punch! Rated at 40 watts on CW, can also operate on suppressor-modulated phone at reduced input. Frequency range is 2 to 9 mc with plug-in coils but no trick to convert to 10 or 20 meters. The small physical size, 11"x6"x6" makes this unit ideal for that mobile rig where space is limited. The circuit is MO-PA and the precision dial and tuning capacitor are being used by many as the basis for a VFO to drive their transmitters. Contains four tubes—two, 89's, two 837's.

Good, used condition. Complete with four tubes and one plug-in coil **\$6⁹⁵**

Additional coils \$1.00 each.
(Coil ranges: 2 to 2.5, 3 to 3.67, 3.67 to 4.52, 6 to 7.35, 7.35 to 9.)

COMPLETE TWO-STATION TELEPHONE SETS



A complete answer to the demand for a telephone system between the house and garage or radio room. Ideal also for farm telephone sets. Incorporates magneto ringing system and self-contained batteries.

Two-way system—includes two handsets and handgears, magneto ringers and one 125' roll of outdoor telephone wire **\$17⁵⁰**

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RESIN-CORE SOLDER

60-40 made to Govt. Specs. New material—not reclaimed. 5 pound roll on spool..... \$3.95

BEACHMASTER PORTABLE 250 WATT SOUND SYSTEM

Manufactured by Western Electric and originally designed for use by a Beachmaster to direct activities during landing operations. Ideally suited to applications as "Voice of the Air," etc. Comes in carrying case.

250 WATT AMPLIFIER

Complete with tubes and cables..... \$195.00

SPEAKER CLUSTER

Consists of nine, 35 watt units and horns.. 89.50

GAS ENGINE POWER SUPPLY

Lightweight (approx. 135 lbs.), 110 V., AC at 1500 watts \$249.50

TUBES

5BP4	\$ 4.95	725A	\$24.95
5CP1	3.95	721A	4.35
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811	2.25	2J34	24.95
814	4.95	3B26	5.95
723AB	5.95	310A	4.95
715A	17.95	3C23	4.95
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We have one of the largest tube stocks on the Pacific Coast—over 400 types!

VIBRATOR TRANSFORMER

6 V. pri. Sec. 345-0-345, 135 ma.	\$1.95
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PL54 29c 100'	\$4.95
Push-button variable for supers. 4 section, cut osc. plate (less bakelite buttons), new.....	89c
2 GANG—cut plate for supers, new.....	69c
FLBA Filters	\$2.95

CONDITIONS OF SALE

All prices F.O.B. San Francisco, Calif. (Calif. purchasers add 2 1/2% sales tax). All items subject to prior sale. All prices subject to change without notice. Minimum order, \$2.50.

Terms: Cash or 25% with order, balance on delivery. Foreign orders cash.

APN-1 ALTIMETER

Don't sell this one short! The range of 420 to 460 mc provides all the makings for an experimental unit for use on the Citizens and Amateur bands near these frequencies. Fourteen tubes—and a 27 volt dynamotor! A hot experimental item.

New—complete with tubes and dy- **\$9⁹⁵**

namotor

Without tubes \$4.95

NON-INDUCTIVE CARBON RESISTORS

50 ohm, 4 watt, carbon. Calm down those 807's! 19c

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Ceramic cones—1 3/4" base—threaded brass rod 5" long 19c

RESISTOR KITS

100 assorted 1/4, 1/2, 1 watt..... bargain at \$1.95

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Cad. pl. steel. No. 6, No. 8 screw..... 100 for 24c
1000 for \$1.95

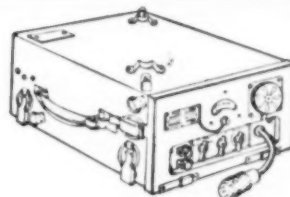
HEADSETS

HS-16—new, boxed..... \$1.89

HS-30—new95

HS-33—like new 2.25

HS-33—good, used 1.45



BC-659

TRANSMITTER-RECEIVER UNIT

A beautiful little piece of gear covering from 27 to 38 mc. Transmitter is FM, two-channel, crystal controlled. Receiver is crystal controlled, two-channel, two RF stages, two IF stages with limiter and discriminator. Particularly well suited for amateur, police, forestry or marine applications.

NOTE! Models offered are the highly desirable "J" and "K"!

Used but in excellent condition with tubes but less power supply and crystals **\$9⁹⁵**

BC-620 TRANSMITTER-RECEIVER UNIT

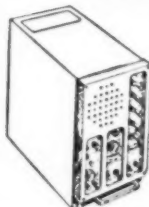
Similar to the BC-659 except one RF stage and no panel speaker. Frequency range is 20 to 27.5 mc. A natural for 11 meters and a simple job to convert to 10. Components alone in these units are worth many times the asking price.

Used but in excellent condition **\$7⁹⁵**

POWER SUPPLIES for BC-659 and BC-620

PE-97 to operate BC-620 from 6V battery—used, good condition.....	\$7.95
PE-117 to operate BC-659 from 6 or 12 V. battery—used, good condition.....	7.95
PE-120 to operate BC-620 and/or BC-659 from 6, 12 or 24 V.—used, good condition. 9.95	

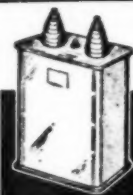
BC-603 RECEIVER



A complete receiver covering 20 to 27.9 mc with continuous manual tuning or with ten-channel push-buttons. Beautiful mechanical and electrical construction. 10 tubes. Many amateurs are using these receivers as converters with military receivers having no 10 meter band. A cinch for this job—no wiring changes required—merely change trimmer settings. The unit has limiter, discriminator and squelch circuits and makes an excellent FM receiver without modifications.

With tubes but less dynamotor power unit. Good, used condition **\$11⁹⁵**

DM-34 for BC-603, 12 volt..... \$2.45



1 MFD: 15 KV, DC.

General Electric Pyranol. New, in original wood boxes. Two insulators—floating ground

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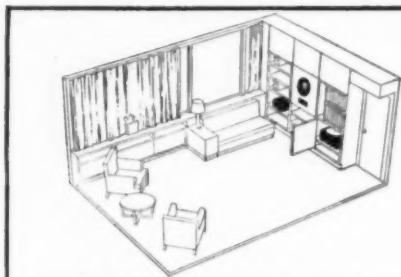
In addition to a wide variety of desirable surplus material, San Francisco Radio & Supply Co. carries extensive stocks of all nationally advertised merchandise. It is, in fact, one of San Francisco's oldest and best known amateur supply houses.

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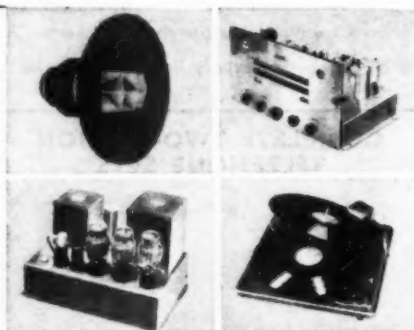
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One of many alternative placements of elements. In actual installation, speaker will be concealed by decorative fabric.

As an engineer with professional knowledge of the science of audio reproduction, you can appreciate more thoroughly than any layman the incredible life-like reproduction of voice and music of which this magnificent Altec Lansing Home Music System is capable. Added to the lifetime enjoyment which this system will provide is the pleasure of installing it yourself. Full instructions are included. This system transcends the inherent limitations of commercial radio-

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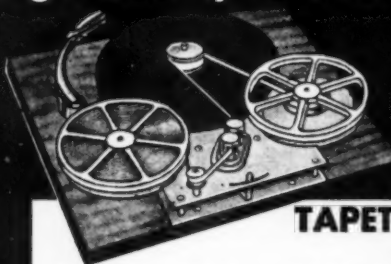


phonographs, yet costs are favorable to this system. The system includes the famous Altec Lansing Duplex speaker, a special Altec Lansing amplifier, a newly designed TRF Altec Lansing tuner, and the Webster 70 changer. Built-in Altec Lansing Daylight Television can also be included.

A brochure will be sent on request.

ALTEC
LANSING
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TAPETONE MAGNETIC TAPE RECORDING KIT

For Homes, Schools, Studios... Set Builders, Hams, Radio Engineers are all enthusiastic about the newly developed TAPETONE Magnetic Tape Recorder. • Records voice and music on tape. • Plays up to 12" platter records and reproduces from the records on to the tape. • Records radio reception on tape. Tape can be played back and re-recorded hundreds of times.

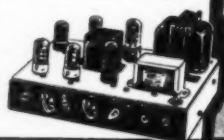
THE RECORDING-PLAYBACK MECHANISM

(Illustrated above) comprises heavy duty General Industries motor mounted on rubber, and 10" 3 lb. turntable. Complete tape drive mechanism of exclusive TAPETONE design. Precision tooled with bronze bearings throughout for marvelously smooth quiet operation. Lever has Record-Play, Neutral, and rewind positions. Crystal pickup with permanent stylus. Separate Record-Play and Erase Heads, plug-in type TAPETONE exclusive design. Recording magnetic paper tape is simple to thread and can be edited more easily than home movie film. TAPETONE MAGNETIC TAPE RECORDING MECHANISM, NOW AVAILABLE SEPARATELY, includes; Recording-Playback mechanism illustrated and described above, for 115 Volt 60 cycle AC only; completely assembled plus mounting board; Amplifier wiring diagram; one 1/2 hour roll (1225 ft.) of new SCOTCH HIGH FIDELITY MAGNETIC RECORDING TAPE. Shpg. Wt. 22 lbs.

Your net cost **\$62.50**

THE EQUALIZED AMPLIFIER

This specially-designed 6-tube recording and playback amplifier is equipped with exciter circuit for operation with mechanism above. Has high impedance microphone and phono-radio inputs with separate gain controls, permits mixing. Output connects to 4 or 8 ohm speaker voice coil. Supplied in kit form, with all components, tubes, drilled chassis, wire connectors, plugs, cables, nothing else needed — no special knowledge required to construct it. For 115 Volt 60 cycle AC only.



COMPLETE TAPETONE MAGNETIC TAPE RECORDING KIT

Includes Recording-Playback Mechanism and Amplifier Kit described above, plus one 1/2 hour roll (1225 ft.) of new SCOTCH HIGH FIDELITY MAGNETIC RECORDING TAPE. Shpg. wt. 30 lbs. Express collect.

\$98.50

Your net cost, Complete Please include 20% deposit with C.O.D. Orders

OPTIONAL ACCESSORIES: Crystal Desk Mike with removable base and 7-ft. cable... List \$16.00. 8-inch Heavy Duty PM Speaker... List \$8.95. Additional 1/2 hour rolls Scotch Recording Tape, per roll. \$3.50 (Plus 15¢ postage when ordered separately)

PORTABLE CABINET FOR COMPLETE ASSEMBLY AVAILABLE

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Phone: STillwell 4-8380

Ladder-Type Mast

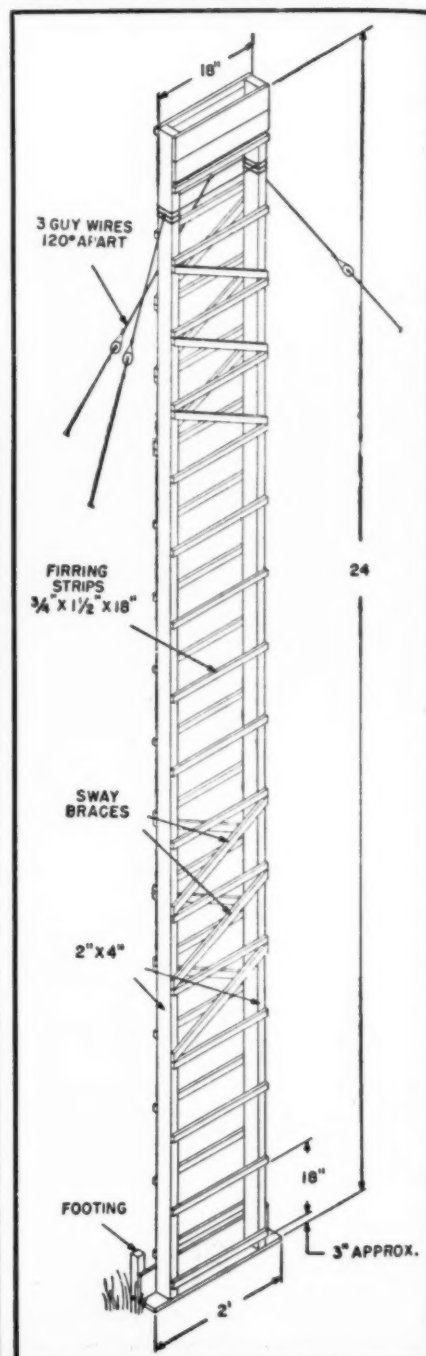
(Continued from page 57)

and securely, at which point the ladder mast now became entirely self-supporting.

However, to further secure the base, additional 2 1/2 foot stakes of furring strip were driven at the base of the mast and several turns of guy wire fastened at this point to bind the footing and prevent the ladder mast from walking.

With the mast in position, the next problem was one of getting the two element 20 meter beam in place. This was accomplished by the use of an

Construction details for building mast. The entire unit was built in a few hours using just standard household hammer and saw.



RADIO & TELEVISION NEWS

extension ladder since the length of a twenty meter beam presented an awkward problem.

It is not intended to describe the beam in use here inasmuch as there is a quantity of information available on this subject.

However, it has been demonstrated that this mast can carry the weight of three men at one time, since at one point in the beam raising, an element snagged a guy wire and required the assistance of the two neighbors to climb the mast on either side and free the element; this, with the author at the top of the mast.

We are looking forward with no hesitancy to placing an electrically driven rotator and 3 element 20 meter beam at the top of this structure.

The height of this ladder mast has proven entirely satisfactory for twenty meter operation and should prove an excellent height for ten meter operation.

It was also our intention to describe this ladder mast so it may take a place in the thought of amateurs, along with the other types when considering the construction of a mast or tower for a beam or plain skywire.

-30-

Mae's Service Shop

(Continued from page 58)

appear between this point and A and this point and C. By sliding the little clip of our one-string fiddle up and down the resistance wire, I can reach a point where the meter will show exactly equal voltages across the resistor and across the voice-coil."

"That means that the impedance of the resistor is the same as that of the voice-coil, huh?"

"Right; and while the impedance of the voice-coil is made up of its d.c. resistance and its a.c. inductance, the impedance of our resistor is practically that of its d.c. resistance alone, for a straight wire like this has negligible inductance at 400 cycles."

"So all we have to do is to measure the resistance with an ohmmeter, and we know the impedance of our voice-coil," Barney said; "but why did you use the vacuum-tube voltmeter? Wouldn't the multimeter have worked just as well?"

"Yes, for we are not interested in absolute values. All we need to know is that the two voltages are equal. I use the vacuum-tube voltmeter through force of habit when measuring an a.c. voltage other than 60 cycles. Copper oxide rectifier meters are quite frequency-conscious, and they are calibrated at 60 cycles; so they are not too reliable at other frequencies."

"You use this special kind of rheostat in order to get away from the inductance you would find in an ordinary spiral-wound job. That I get; but wouldn't the impedance of the voice-coil change if you used some frequency other than 400 cycles?"

IT PAYS To Buy Hallicrafters

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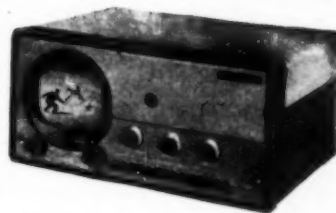
"The World's Most Personalized Radio Supply House"



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T-54 TELEVISION

Precisely engineered, provides perfect image picture 4" by 5 7/8" with controlled selectivity. Contains 18 tubes plus cathode ray and three rectifiers. Beautifully styled, functional design.



\$189.50

Down Payment
\$37.90

MODEL 505 same as T-54 but comes in blond or mahogany wood cabinet.

\$199.50

SX-43 RECEIVER

An excellent amateur communication receiver—10 tubes plus rectifier. Frequency range continuous from 540 KC to 55 MC, and from 88 to 108 MC. Has provision for both FM as well as AM reception.



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R-44 SPEAKER
\$24.50 EXTRA

S-53 RECEIVER

Eight tubes — 5 bands from 540 KC to 545 MC. Here is a popular receiver for both the amateur and short wave listener.



\$89.50

Down Payment
\$17.90

IT'S EASY TO BUY FROM W.R.L.

It pays to buy Hallicrafters from WRL because every model is available for immediate shipment. Use your present receiver as a trade-in. WRL offers the lowest E-Z payment plan in the country. Write to Leo I. Meyerson W6GFQ for prompt personal attention.



GIANT RADIO REFERENCE MAP

Just right for your control room wall. Approximately 28"x42". Contains time zones, amateur zones, leading shortwave stations, monitoring stations.

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and WARREN is FIRST with

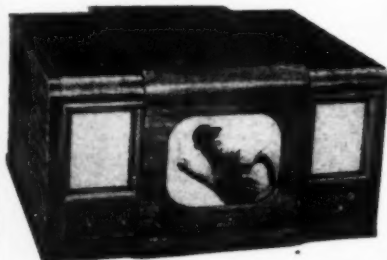
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with BIG 10" SCREEN
17 TUBES; STRAIGHT AC CHASSIS
Exceptional performance in fringe areas

Only \$189⁵⁰
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The Standard of the Industry
10" Screen—30 tubes. Walnut or Mahogany Cabinet. Safety High Voltage Supply. Horizontal Lock-in Circuit. Automatic Picture Stabilizer.
\$375.
List Price

TEMPLE H-623 CONSOLE



\$90.97
Net Dealer Price

Radio-phonograph combination. Standard Broadcast and S.W. Six tubes. Automatic Changer. New tilt front. Twin Speakers. Exceptional Value!

DEALERS: Write on business letterhead for discounts and complete catalog of F.M. and Television Accessories.

WARREN DISTRIBUTORS

3089 WASHINGTON ST. BOSTON MASS.

"It would, but unless stated otherwise, all audio equipment impedances are given for 400 cycles. Your matching chart for the output transformer is worked out for 400 cycles."

While Mac watched, Barney turned on the receiver and carried out the procedure outlined. It was found that the voice-coil impedance was very near six ohms; so the proper taps were connected.

"Say, Mac," Barney suddenly said, "I have to give a little talk tonight at the Y. Each of us is supposed to talk on 'What Makes a Good —'; and we fill in the blank with what we want to be. I want to be a serviceman; so how's about giving me some pointers?"

Mac rubbed his chin for a few seconds, and then he said slowly, "I think that the ability to play the game of 'Twenty Questions' is what it takes to make a good serviceman."

"Come again," Barney said in bewilderment.

"You know the game. One person thinks of an object, and the idea is to identify it by asking not more than twenty questions. The cleverest person is the one who can name the object with the fewest questions."

"Radio servicing is like that. Instead of an unknown object, you have an unknown trouble to find. You ask yourself the questions, and you make tests to find the answers. The good serviceman is the one who can spot the difficulty with the fewest number of tests."

"You will remember that the classical first question in the game of 'Twenty Questions' is: 'Is it animal, vegetable, or mineral?' That is a fine question, for it immediately cuts down the field to be investigated by two-thirds. The serviceman who puts an

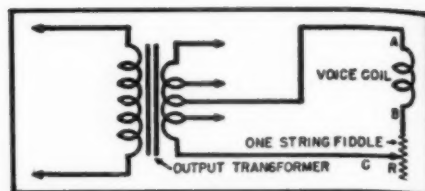


Fig. 2

audio signal into the first audio stage of a 'dead' receiver and hears it coming out of the speaker has done about the same thing, for he knows that the trouble is ahead of this point.

"The main idea is not to ask unimportant questions that waste time. For example, instead of finding out what kingdom the object was in, a foolish person might ask, 'Does it wear a hat?' The answer would be 'no' whether the object was a turnip, a lump of coal, or a red-headed radio apprentice, and that question would be wasted. The fellow who simply prods around in a set checking condensers, resistors, voltages, etc., without any plan or purpose is playing the game in the same stupid manner. I am more impressed by the head-scratching, diagram-studying serviceman than I am by the fellow who thinks he is not working unless he has a pair of test-prods in hands."

Barney, who had been scratching down notes on a torn-open volume control box, looked up with a grin. "Thanks a lot, and I'm after thinking 'tis a fine speech you are going to be making with my mouth this evening, Mr. McGregor," he said; "and I hope you'll be remembering after this that when you catch me staring off into space, I am not thinking about Margie; I am simply playing 'Twenty Questions'!"

—50—

LOCATING METER SCALE DIVISIONS

BY GEORGE A. BURNS

WHILE experimenting with several different meters and values of center scale resistance in a series ohmmeter circuit I had occasion to draw several accurate scales to expedite checking the complete meter.

I soon discovered that I was spending more time calculating values for the scale than I had spent on the design of the electrical circuit. After wading through several formulas, all of which seemed to be rather complicated, I de-

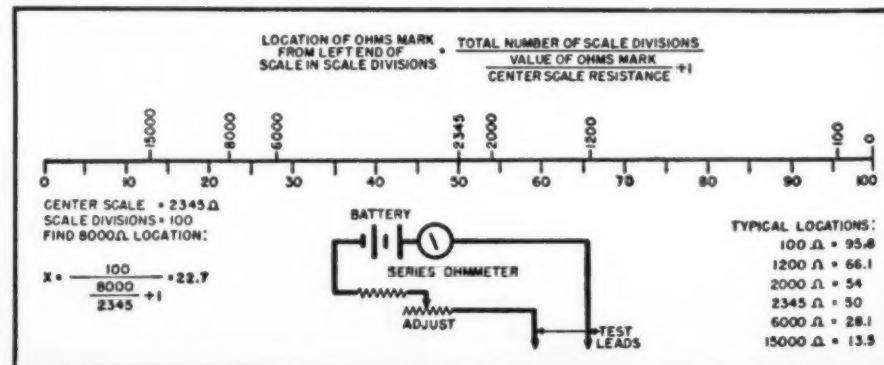
termined to find a simple method for locating the "ohms marks," using the most basic information possible.

For example: Given a series ohmmeter with a total internal resistance of 2345 ohms and a linear scale of fifty divisions. The problem is to find the location of 100, 2000, 2500, and 15,000 ohm divisions on the ohmmeter scale.

To solve this problem use the formula given in Fig. 1 worked out for 100 scale divisions.

—50—

Fig. 1





MICROWAVE TS-12AP TEST SETS

Brand New!
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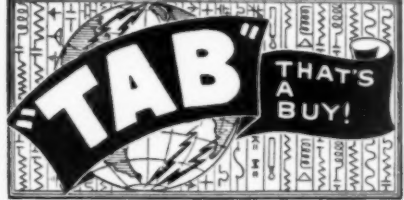
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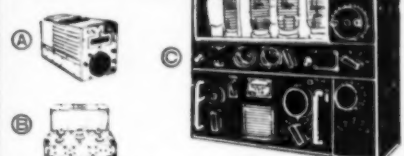
116	179	680	2600	13500
.42	182	684	2635	14000
.425	199	689	2700	14400
.607	200	697	2850	14400
1.01	209.4	700	2860	14400
1.3	216	733	2900	14500
1.75	220.4	800	3000	15000
3.83	225	806	3100	15500
4.35	239	854	3354	17000
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7.5	271	1000	4000	19500
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7.5	280	1056	4280	20520
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16.37	375	1350	5200	25200
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20	400	1495	5500	27500
21	410	1500	5600	28000
25	414.3	1510	5730	29500
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60	452	1680	6500	38140
63	470	1710	6840	38500
68	475	1740	6900	39000
71.4	478	1770	7000	40000
74	480	1800	7500	43000
75	487	1818	7700	47000
80	500	1830	7930	48000
81.4	520	1865	8000	48660
89.8	525	1900	8250	49000
90	540	1910	8500	50000
95	550	1960	8700	52000
100	575	2000	8992	54000
101	580	2045	9000	56000
103	600	2080	9445	60000
105.7	607	2145	9500	611430
107	612	2145	9710	62000
113.1	625	2160	10000	64000
120	633	2195	10430	65000
121.2	640	2200	10500	68000
125	641	2250	10600	70000
147.5	649	2300	11000	72000
150	650	2400	11400	75000
160	657	2450	11500	80000
165	665	2463	11690	84000
170	669	2485	12000	90000
173	670	2490	12600	91000
100000	155000	240000	353500	575000
110000	166750	245000	380000	600000
115000	169360	250000	400000	620000
120000	180600	255000	402000	621000
125000	185000	260000	422000	654000
130000	201000	275000	458000	750000
135000	220000	294000	478000	761300
140000	225000	307500	500000	800000
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1 Meg	2 Meg	3.5 Meg	4.23 Meg	10 Meg
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1.5	3	3.9	5	12.83
1.8	3.673	4	9.05	20

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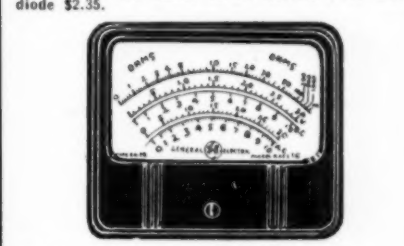


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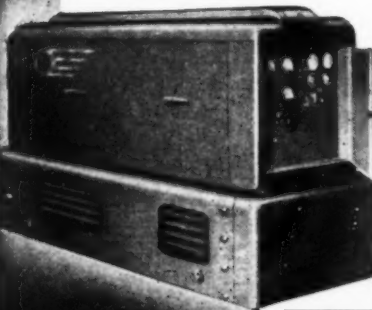
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Distortion Meter

(Continued from page 69)

tortion, thereby removing the need to
make a special meter scale or conver-
sion chart. This meter circuit affords
a good degree of linearity. Any de-
parture from linearity, due to indi-
vidual crystal characteristics, has been
found by test to affect the accuracy
of the instrument only slightly. In-
creased accuracy may be obtained by
switching in lower resistance multi-
pliers for closer reading of the meter
at null. The addition of these multi-
pliers is discussed in detail under
"Meter Switching for Increased Accu-
racy." It is not possible to employ a
less expensive 0-1 milliammeter, since
the internal resistance of that instru-
ment is too low for this application.

The choke coil, CH_1 , is an important
part of the circuit. For satisfactory
results, this component must have the
proper ratio of reactance to resistance.
A number of chokes were tested in the
circuit during the development of the
instrument, and the reader is cau-
tioned to use the particular one speci-
fied in Fig. 4A.

The input jack, J_1 , allows easy dis-
connection of the input leads. The 2-
lead, flexible input cable, seen at-
tached in Fig. 1, has clips on one end
for connection to the loudspeaker
voice coil and a plug on the other end
for insertion into jack J_1 .

The distortion meter is built in a
 $10\frac{1}{2}$ " x $7\frac{1}{4}$ " x 6" metal cabinet. This
is a standard radio box. No chassis is
employed, all components being fas-
tened to the front panel. Fig. 5 shows
arrangement of the components be-
hind the panel.

The input gain control (R_1) and
changeover switch (S_1) are accessible
from the front of the panel. Rheostat

Table 1. Calibration data for new meter
ranges. This data is only typical, hav-
ing been taken with a sample crystal.
Individual calibration will be necessary.

METER SWITCH IN 10% POSITION

R.M.S. Volts Input	Micro- Amperes	% Dist.
1.0	100	10
.9	82	9
.8	71	8
.7	62	7
.6	50	6
.5	40	5
.4	32	4
.3	23	3
.2	16	2
.1	6	1
0	0	0

METER SWITCH IN 5% POSITION

R.M.S. Volts Input	Micro- Amperes	% Dist.
0.5	100	5
.4	78	4
.3	56	3
.2	38	2
.1	20	1
0	0	0

R_2 is mounted on a bracket behind the panel, however, and provided with a slotted shaft for screwdriver adjustment, since this component needs no readjustment after it once has been set during the initial calibration of the instrument.

The low resistance value of the input gain control, R_1 , has been chosen for minimum interaction with the crystal rectifier operation. Since most of the serviceman's distortion measurements will be made across low impedance voice coils, and at the relatively low impedance output of audio oscillators, we believe this low input resistance will not be detrimental.

Wiring is simple and straightforward. It is advisable to run all leads as straight and direct as possible. Shielding of leads is not required. In the meter circuit, the correct polarities of both meter and crystal (as shown in Fig. 4A) must be observed. Also, resistor R_2 must be placed ahead of the crystal, as shown in the schematic. If the reader accidentally wires the crystal backwards into the circuit, he must not reverse the meter connections to obtain up-scale deflection, since this arrangement will measure negative half-cycles. If this mistake is made, rewire the crystal correctly.

Initial Adjustment

1. Connect input jack of distortion meter to output terminals of variable-frequency audio oscillator.
2. Set output control of oscillator to maximum.
3. Throw switch S_1 to "SET."
4. Set oscillator frequency dial to 400 cycles.
5. Adjust gain control R_1 for full-scale deflection of microammeter.
6. Throw switch S_1 to "READ," noting drop in meter deflection.
7. Tune oscillator dial above and below 400 cycles, noting that meter deflection passes down through very low value (null) and up again. Retune oscillator dial carefully for lowest "dip" in microammeter reading. This setting of oscillator dial should be 400 cycles. If it is not, due to inaccuracies in condensers C_1 and C_2 , mark exact point on oscillator dial for quick retuning in future to distortion meter frequency.

8. Adjust rheostat R_2 carefully for still lower reading of microammeter at null. The improved null point will be found very definitely in adjustment of the rheostat. Beyond the null setting of R_2 , the meter reading again will rise.

9. When the best null point is obtained, the meter very likely will not read exactly zero. The reading at this point is the distortion percentage of the audio oscillator. This figure must be recorded, since it should be taken into consideration whenever the oscillator is used subsequently in distortion measurements.

After these adjustments are completed, the distortion meter will be ready for use. When making distortion

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BC-454-3—6 MC.

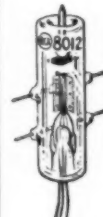
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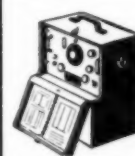
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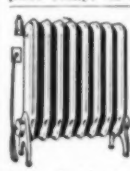
NAVY A-14/Y-10A TRANSMITTERS. BRAND NEW. Freq. coverage 2-20 megacycles. Master VFO or 4 xtal positions. 110 or 220 volt power equip. 40, 50 or 60 cycles. Pair of 813 tubes in Final RF. Constant type PI network for ant. matching. Consists of two racks of equipment: Power supplies, relays, speech and modulator in one rack. VFO (807) buffers (807's) final (813's) in other rack. Units slide out for easy accessibility. Interlocks and fused throughout. Voice operated carrier control. Really a Ham's dream! Price with complete set of tubes \$495.00.



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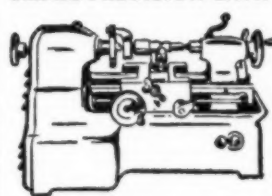
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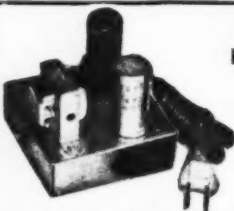


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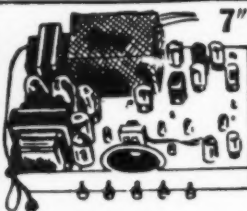
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tion measurements, the audio oscil-
 lator always must be set exactly to the
 null frequency of the distortion meter.
 This may be done either by setting the
 oscillator frequency dial exactly to
 the point marked in Step 7 or by tun-
 ing for minimum dip in meter reading
 with switch S_1 thrown to its "SET"
 position.

Using the Meter

A. Measuring Amplifier Distortion

1. Connect input terminals of dis-
 tortion meter to voice coil of loud-
 speaker. If test must be noiseless, re-
 place speaker voice coil temporarily
 with resistor having same ohmic re-
 sistance as voice coil impedance value,
 and rated at twice wattage of ampli-
 fier output.

2. Connect audio oscillator to am-
 plifier input terminals.

3. Throw switch S_1 to "SET."

4. Advance amplifier gain control to
 maximum, or to the point at which it
 is desired to check distortion.

5. Advance oscillator output control
 slightly.

6. Advance distortion meter gain
 control (R_1) for full-scale deflection of
 meter. Advance oscillator output con-
 trol further, if necessary.

7. Throw switch S_1 to "READ," and
 read distortion percentage directly

from meter scale. Before recording
 this figure, make certain that oscil-
 lator frequency is correct—retune dial
 carefully for lowest null. From dis-
 tortion figure obtained from meter,
 subtract oscillator distortion percent-
 age previously obtained in Step 9 un-
 der "Initial Adjustment."

8. Separate distortion measurements
 may be made at different settings of
 the amplifier gain control or at vari-
 out levels of amplifier input signal
 voltage. In each instance, first set
 meter to full scale (by means of R_1)
 with switch S_1 in "SET" position. Dis-
 tortion readings will be helpful in
 checking the effect of altering the
 value of load resistors, coupling con-
 densers, and changing tubes and volt-
 ages within the amplifier under test.

**B. Measuring Distortion of Audio
 Oscillator**

1. Connect audio oscillator output
 terminals directly to distortion meter
 input terminals.

2. Set oscillator frequency dial to
 400 cycles.

3. Set switch S_1 to "SET."

4. Advance oscillator output con-
 trol to maximum.

5. Set meter to full-scale by means
 of gain control R_1 .

6. Throw switch S_1 to "READ," not-
 ing drop in meter reading. Adjust

Table 2. Total distortion percentages for output tubes operated at
 maximum power output. It may be assumed that they are op-
 erating as single-ended Class A_1 except where noted otherwise.

1A5GT 7.0	6N7 } p. p. class B 8.0
1C5GT 10	6N7GT } single-ended class A_1 12
1D8GT (pentode section) 10	6V6 } p. p. class AB ₁ 3.5
1E7G p. p. class A_1 5.5	6V6GT 10
1F4 p. p. class AB ₁ 4.5	7A5 10
1F5G p. p. class AB ₁ 4.5	7B5 single-ended class A_1 15
1G5G 11	7C5 p. p. class A_1 4.0
1G6GT/G p. p. class B 4.0	7C5 single-ended class A_1 12
1LA4 7.0	10 5.0 (2nd harmonic)
1LB4 10	12A5 11
1N6G 7.0	12A6 7.0
1S4 12	12L8GT 10
1T5GT 7.5	25A6 10
2A3 single-ended class A_1 5.0 (2nd harmonic)	25A6GT/G 10
p. p. class AB ₁ 5.0	25A7GT/G 9.0
2A5 single-ended class A_1 fixed bias 9.0	25AC5GT/G 10
cathode bias 9.0	25B5 9.0
p. p. class A_1 fixed bias 4.0	25B6G 15
cathode bias 3.0	25C6G 10
3A4 6.0	25L6 10
3LF4 series filament 8.5	25L6GT 10
parallel filament 6.0	25N6G 9.0
3Q4 series filament 7.0	26A7GT single-ended class A_1 (each unit) 7.0
parallel filament 7.0	p. p. class AB ₁ 5.0
3Q5GT series filament 8.5	32L7GT 9.0
parallel filament 6.0	33 7.0
3S4 series filament 13	35A5 10
parallel filament 12	35B5 10
3V4 series filament 7.0	35L6GT 10
parallel filament 7.0	38 8.0
6A6 p. p. class B 8.0	41 single-ended class A_1 15
6AC5G 10	p. p. class A_1 4.0
6AC5GT 10	42 single-ended class A_1 fixed bias 9.0
6AD7G (pentode section) 8.0	cathode bias 9.0
6AG7 7.0	p. p. class A_1 fixed bias 4.0
6AK6 10	cathode bias 3.0
6AQ5 single-ended class A_1 12	43 10
p. p. class AB ₁ 3.5	45 p. p. class AB ₂ fixed bias 5.0
6B4G single-ended class A_1 5.0 (2nd har- monic) p. p. class AB ₁ 5.0	cathode bias 5.0
6B5 10	47 6.0
6F6 } single-ended class A_1 fixed bias 9.0	48 9.0
6F6G } cath. bias 9.0	50B5 9.0
6F6GT } p. p. class A_1 fixed bias 4.0	50L6GT 10
cathode bias 3.0	53 p. p. class B 8.0
6G6G 10	70L7GT 10
6K6GT single-ended class A_1 15	89 p. p. class B (triode conn.) 8.0
p. p. class A_1 4.0	117L7GT 5.0
6L6 } single-ended class A_1 (tetrode conn.)	117M7GT 5.0
fixed bias 15 cathode bias 11	117N7GT 6.0
single-ended class A_1 (triode conn.)	117P7GT 5.0
fixed bias 5.0 cathode bias 6.0	1602 5.0
p. p. class A_1 (tetrode conn.)	1621 p. p. class A_1 (triode conn.) 1.0
fixed bias 2.0 cathode bias 2.0	p. p. class A_1 (pentode conn.) 3.0
p. p. class AB ₁ (tetrode conn.)	1622 p. p. class A_1 1.0
fixed bias 2.0 cathode bias 4.0	1631 same as 6L6
p. p. class AB ₂ (tetrode conn.) 2.0	1632 10
6N6G 5.0	1635 p. p. class B 5.0
	1644 10

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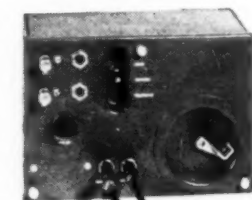
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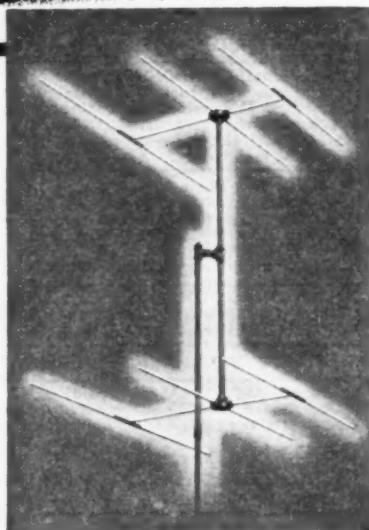
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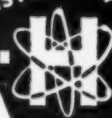
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oscillator frequency dial for lowest reading (null).

7. Read distortion percentage directly from meter scale.

Meter Switching for Increased Accuracy

The single linear meter scale shown on the instrument as described, was adopted for simplicity. On this scale, however, the commonly encountered distortion percentages fall near the lower end where the instrument accuracy is not good. A discriminating operator might object to this.

If the reader desires, increased accuracy can be secured by installing a single-pole, 3-contact meter range switch and two multiplier resistors in addition to R_3 . The two extra multipliers will give distortion meter ranges of 0-10% and 0-5% for closer readings. The circuit modification is given in Fig. 4B.

It will be necessary to make special voltage calibrations of the meter circuit with the new multipliers and either to make two corresponding special meter scales (in addition to the present 0-100-microampere scale) or to prepare a conversion chart for reading the microammeter in distortion percentages. This is because the crystal rectification curve is not linear at the low voltages which correspond to these smaller percentages.

The circuit for the meter range switch is given in Fig. 4B. Typical calibration data is given in Table 1. These calibration points were taken with a representative 1N34 crystal. However, an individual operator must calibrate his own instrument on the 0-5% and 0-10% scales.

The calibration procedure is simple: (1) Connect variable-voltage a.c. source (0-1 volt, adjustable in 1/10-volt steps) to input terminals of distortion meter. (2) Throw distortion switch S_1 (See Fig. 4A) to "SET." (3) Throw meter range switch to 10% position. (4) Adjust input voltage in 0.1-volt steps, starting at 0.1 volt and progressing to 1 volt. (5) Record microampere and percentage readings on chart similar to Table 1 or inscribe special scale on microammeter. (6) Set meter range switch to 5% position and repeat calibration procedure, progressing this time from 0.1 volt to 0.5 volt.

When using the distortion meter, always set the meter range switch first to its 100% position, with switch S_1 at "SET," and adjust gain control R_1 for full scale deflection. Then throw S_1 to "READ," and change setting of meter range switch to give distortion indications in upper part of meter scale.

Operating Pointers

The audio oscillator used in distortion measurements must, for ease of operation and best accuracy, have good output waveform. Its own total distortion should be as low as possible.

False readings can be produced on the distortion meter by voltages due to noise, hum, or oscillation arising with-

in the amplifier under test. For this reason, it is advisable to make an aural test by means of the loudspeaker and to correct noise, hum, or oscillation before undertaking the measurement of distortion.

Much of the distortion commonly encountered in p.a. amplifiers arises in the output stage. The chart in Table 2 lists the tabular values of total distortion for output amplifier tubes operated at maximum power output. Distortion values differ somewhat for the same tube operated at different plate voltages or in a different class of amplifier (A, AB, B, etc.). The values in Table 2, however, are for the highest-output method of operation for each tube.

The voltage output of some amplifiers will not be high enough to give full-scale deflection of the distortion meter when switch S_1 is in its "SET" position. In such cases, it will be necessary either to employ a low-distortion 1- or 2-stage audio amplifier ahead of the distortion meter or to calculate the distortion percentage from the meter deflections that can be obtained. For calculations, first throw switch S_1 to "SET" and adjust gain control R_1 for the highest meter reading. Call this reading D_1 . Then, throw switch S_1 to "READ" and record the lowest obtainable null reading as D_2 . The distortion percentage is equal to $(D_2/D_1) \times 100$.

With a little practice, the distortion meter can be used with as much ease and simplicity as any non-electronic ohmmeter. Once its use has been mastered, this instrument will prove a useful adjunct to any amplifier service shop.

-50-

The first metal television receiving tube to be manufactured on a continuous production basis has been announced by Tel-O-Tube Corporation of America, which has solved the problem of joining glass to metal to obtain an air-tight seam. This giant new 16 inch direct view tube, now available in home receiving sets, provides a larger picture than an all-glass tube of the same diameter — nearly 150 square inches of image — because it "scans" without distortion almost to the outer edge of the picture screen. The metal tube is lighter in weight than an all-glass tube and provides better shielding against stray light and other interference, according to the tube's manufacturer.



AMAZING, MY DEAR WATSON To find desirable surplus at this late date—BUT HERE IT IS!



20 to 28 MC FM PORTABLE TRANSCEIVER BC-620 for 11 & 15 meters; can be extended to 10 meters by adjust. IF's; similar to BC-659 at left, but without speaker or handset. WITH PE-120 power supply (see below), meter, dry batt. BA-41 & diagram. UN-USED, slightly shopworn **\$27.95**
Xtals f/BC620, choice, \$1; extra diagram or BA-41 **.50**
Handset T5-13 with PL-55 & PL-68, U-1 **3.95**
Shock-Mount Rack FT-250 (quantity limited) ... **2.50**
Antenna, 3-sect. screw-in type (quantity limited) **2.15**

ACCESSORIES FOR BC-659

In addition to those listed above for BC-620 (which will also fit BC-659), we have:

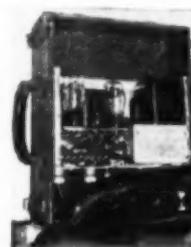
Adaptor M-399 for align. Converts rec. ampl. stage to VTVM circ. using meter of set. NEW **\$ 1.50**
Crystals, choice of any channel 27 to 38.9 Mc, ea. **1.00**
Set of 120 xtals covering 27 to 38.9 Mc, in case. **40.00**

VIBRATOR POWER SUPPLY PE-120 for BC-659 and BC-620; operates from 6, 12 or 24 v. depending on vibrator. With 12 or 24 v. vibrator, battery cable and plug (30 lbs.). UN-USED **\$12.95** U-1 **\$9.95** U-2 **\$7.95**

SOUND-POWERED HANDSET T5-10 with cord and plug. NEW, per pair **\$27.95**

TELEGRAPH SET TG-5 bat. operated; includes key, earphone, buzzer, bell and sensitive relay, in case 7"x5"x4", 8 lbs. (U-2). Each **\$3.65** Two for **\$6.95**

SIGNAL GENERATOR, Ferris No. 18C Microvolter; range 5 to 175 Mc in 7 bands; EXT, 400 or 1000 cycle mod; calibration chart. A precision instrument at 1/3 original cost; used, guaranteed **\$125.00**



PE-120

PORTABLE TELEPHONE EE-8

With handset, generator, ringer, etc., in case. Fine for garage extension, farm phones, warehouses, etc. For magneto or common battery lines. EACH PHONE TESTED BEFORE SHIPMENT. Used, good **\$9.95**

MIDGET HEADSET, hearing-aid type HS-30. NEW, two for **\$1.85**; each **\$0.95**

"WALKIE-TALKIE," Navy model MV, 2.5 to 4.5 Mc xtal controlled; similar in size and wt. to BC-611 "Handie-Talkie." Ideal for "ham," forest service, foreign trade, marine, etc. Uses 6 peanut tubes (1-1R5, 2-1T4, 3-3S4) and standard dry batteries which fit inside waterproof case; wt. less than 6 lbs. w/o bat. LIKE NEW, with 2 matched xtals, mike, headset and diagram, less bat., 2 for **\$58.** Each **\$29.95**



VERSATILE VIBRATOR, Hi-frequency extra-heavy duty, Rauland No. JV-0014. The "heart" of PE-237 power supply for SCR694 (BC1305 and BC1306). Input 6, 12 or 24 volts, depending on pin connections used; output 200 cps $\pm 1\%$; 20 extra-heavy contacts, rated 35 amps continuous duty, each brought to separate base pin; case 2 1/4"x2 1/2"x5 1/2". NEW, orig. boxes **\$4.95**

ARE YOU CONFUSED? LET US HELP YOU

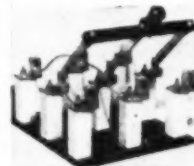
Cross-reference tube list—gives commercial type for Army VT numbers. 3 for **\$1**; each **\$0.50**

Schematic diagrams for SCR274N; ART13; SCR269G (BC433G compass); SCR522; RT7/APN-1; RA34; BC611 Handie-Talkie; Navy MV "Walkie-Talkie"; BC659; BC620; BC603 or BC683; BC604 or BC684; RT19/ARC4; Super-Pro Army types BC799, BC794, BC1004. Each type **\$65**



VIBRATOR POWER SUPPLY PE-157. Operates from 2 v. wet cell (not included) which fits inside. Output: 1.4 v. at 500 ma and 125 v. at 50 ma or 1.4 at 350 ma and 60 v. at 15 ma. Case 6"x6"x1 1/2" contains 4" speaker, vibrator, bat. compartment, xfms, diagram, etc. LIKE NEW, with cable and plug **\$6.95**

ANTENNA SWITCH 3PDT. Extra-heavy contacts, porcelain stand-offs; base 7"x8"x1/4". Insulators alone worth more than price of switch. NEW, boxed, each **\$0.99** PER DOZEN **9.95**



CRYSTALS in FT-243 holder (fits octal socket). Any freq. 5675 to 8650 Kc in steps of 25 Kc EXCEPT 7175, 7200, 7225, 7250, 8025, 8100, 8125, 8400 (sold out). EACH **\$1.00**

* U-1: used, excellent; U-2: used, good

We buy and trade receivers, transmitters and test equipment. What have you?

Postage extra. Minimum order \$2.00. TERMS:
Net Cash, 25% deposit on C.O.D.'s. FREE LIST.
Prices subject to change without notice.

ELECTRONIC SUPPLIES

317-R East 2nd St. Tulsa 3, Oklahoma

NEW RECEIVERS for Winter Market

PROJECTION TV

Life-size television pictures for hotels, clubs, places of amusement, etc. are provided by the new *RCA Victor* commercial projector announced recently by *Radio Corporation of America*.

Featuring a reflective optical system, the pictures produced by the new projector may be tailored to suit screen sizes ranging from 3 x 4 feet to approximately 7 x 9 feet.

The Model TLS-86 is capable of producing an image about 63 square feet in area with the projector located 17 feet from the screen. A simple focusing system permits adjustment for a shorter projection throw, providing a smaller image. The unit may be mounted on casters for easy dolly-



to the desired position in relation to the screen.

As simple to operate as the conventional home television set, the projector permits instant selection of a desired station. The controls are so arranged that all adjustment can be made without interfering with the projected picture. The sound system is a specially designed unit containing a 10" speaker in an acoustically matched cabinet and is designed for operation adjacent to the projection screen.

Additional information on the Model TLS-86 may be secured from *Radio Corporation of America, RCA Victor Division*, Camden, New Jersey.

LOW-PRICED TV

National Company of Malden, Massachusetts has announced two table model television receivers which will retail in the moderate price class.

The Model TV-7M features a 7" picture tube and provides coverage of all television channels. The circuit uses 21 tubes including three rectifier tubes and the picture tube. The company claims brighter pictures because of the full 4000 volts on the picture tube, coil switching which assures the equivalent

of separate, high "Q" tuned circuits for each channel to improve sensitivity and stability, and automatic gain control.

A special extra-stable synchronizing circuit locks the picture in place and provides steadier pictures. The circuit uses a 37 mc. i.f. instead of the conventional 21 mc. thus minimizing picture interference caused by other radio services, according to the company. Double-tuned r.f. bypass circuits improve selectivity and image ratio. Fine tuning adjustment is provided. Two speakers and hum-free power supply are said to provide clearer, life-like binaural sound.

The Model TV-7W is identical to the TV-7M except that it is housed in a mahogany cabinet.

For full details on these new table model receivers address your requests for additional information to *National Company*, Malden, Massachusetts.

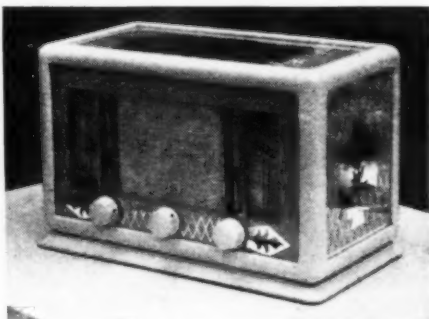
FRENCH SET

The Art Luxe & Technique Corporation of France is currently distributing two of its table model radio receivers in the United States through its New York office.

The Model E-500 is housed in a modern cabinet and covers the broadcast band from 535 kc. to 1600 kc. and two short-wave bands, 3 to 8 mc. and 8 to 23 mc. The set is a specially designed a.c.-d.c. superheterodyne for American use. Two easy-to-read dials are imprinted with the names of American and European stations.

Sensitivity is 5 microvolts at 1200 kc. Selectivity is 4 kc. at 6 db.; 10 kc. at 20 db.; and 18 kc. at 40 db.

The Model C-502 is an ultra-modern table receiver which offers the same tuning range as the Model E-500. A mirrored slide rule dial carries the



names of American and European stations. Bandpass is 40 to 6000 cycles with 4 db. maximum attenuation.

Both receivers use American made tubes and are constructed with standard radio parts. For further details

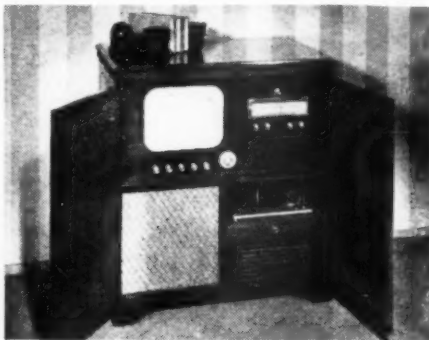
write *The Art Luxe & Technique Corporation*, 220 West 42nd Street, New York, New York.

12" COMBINATION CONSOLE

United States Television Mfg. Corp. of New York has introduced a 12 inch television-radio-phonograph console which will be merchandised as a complete entertainment unit for the home.

Besides the 12 inch direct view television picture, the model has AM and FM radio and automatic record changing phonograph which can handle either 10 or 12 inch records.

The set is housed in a cabinet of mahogany finish which measures 39 3/4" x 33 3/4" x 21 1/2". The console is also avail-



able in bleached mahogany at a slightly higher price.

A unique feature of this model is that it uses a Zetka 12 inch tube with ion trap, the only 12 inch tube with this feature, according to the company. The trap prevents the formation of a brown ion stain which often appears on television tubes without this feature.

For further data on the new combination console, write to *United States Television Mfg. Corp.*, 3 West 61 Street, New York 23, New York.

EMERSON TV

A "4-way" period console which incorporates FM, AM, automatic phonograph, and television has been introduced by *Emerson Radio & Phonograph Corporation* of New York.

Known as the Model 585, this new console features a 52 square inch picture and incorporates a 10 inch tube. Full coverage of all existing television channels is provided. A minimum of operating controls appear on the front panel as installation controls for centering, linearity, size, drive, and focus are at the rear. The company's picture-lock automatic frequency control holds the picture steady at all times, while an a.g.c. circuit amplifies weak signals and reduces blasting of strong signals.

The FM band is covered from 88 to 108 mc. while AM reception is assured from 535 to 1620 kc. An internal FM power line antenna is said to eliminate the necessity for an external dipole in most reception areas. Terminals for external antennas for both AM and FM have been provided if such installation is desired.

The receiver uses a 12 inch Alnico PM dynamic speaker and features a

RADIO & TELEVISION NEWS

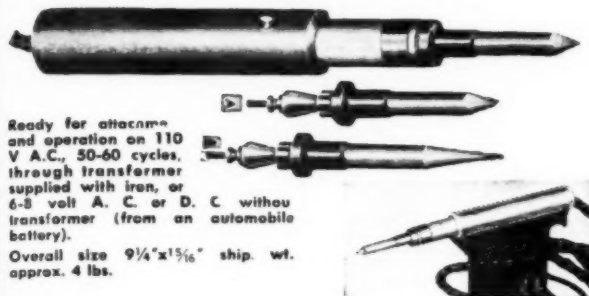
REVOLUTIONARY SOLDERING IRON

TRANSVISION Soldetron

Tr. Mark Reg., Pat. Pend.

For Easier, Better Soldering—on Any Job!

- Weighs only 3 ozs., yet can do the job of a 200 watt iron
- Heats up in 20 seconds from a cold start; saves time.
- Fingertip control; permits soldering without fatigue.



Ready for attachment and operation on 110 V A.C., 50-60 cycles, through transformer supplied with iron, or 6-8 volt A. C. or D. C. with transformer (from an automobile battery).

Overall size 9 1/4" x 1 1/8" ship. wt. approx. 4 lbs.

- Ideal for fine precision work in "hard-to-reach" places.
- Readily interchangeable tip-heads; no cleaning or filing
- Retains heat with switch off up to 1 minute; efficient.
- Bakelite handle, cork covering, for comfortable cool grip.

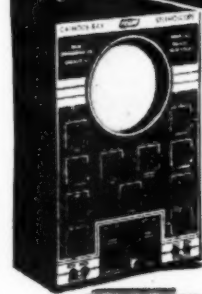
PRICE: including transformer and Tip-Head "A", \$13.95
5% higher west of Mississippi; fair traded.

Ask your distributor, or for further information write to:

TRANSVISION, INC. DEPT. RM NEW ROCHELLE, N. Y.

(In Calif.: Transvision of Cal., 8572 Santa Monica Blvd., Hollywood 46

Are YOU Fixing Radios this New, EASY Way?



Amazing! Sensational! New FM & Television Cathode-Ray Stethoscope

Think of it! Actually many instruments in one including a complete 5" oscilloscope and stethoscope. This high quality instrument has been designed for FM and Television servicing and is ideal for AM and audio work, too. Only by utilizing the most advanced circuits can FEILER offer the CATHODE-RAY STETHOSCOPE at this amazing low price. The C-R STETHOSCOPE will permit you to SEE and HEAR the signal at the same time. The newly-designed STETHOSCOPE PROBE an extra feature not found in other instruments will enable you to solve many of those "impossible" problems in a matter of minutes. The 28-page technical manual, "The Inside Story," tells you all about the C-R STETHOSCOPE. Send coupon today. Learn how you can obtain this remarkable new instrument at the amazing low price of... **\$89.95**

(Less headphones and probe.)
Dimensions: Length 17 1/2", Height 14 1/2", Width 9 1/2". Ship. Wt. 3 1/2 lbs.



November, 1948

Remarkable new "STETHOSCOPE" Method Guaranteed to Lick Toughest Jobs!

Why let old-fashioned methods and equipment hamper your servicing ability? Thousands of radio servicemen—many with little experience—are already fixing radios this remarkable "automatic" way. It's as simple as A.B.C. because **STETHOSCOPE SERVICING** is the newest, most basic method yet devised to simplify all repairs. **STETHOSCOPE SERVICING** is guaranteed to speed-up and improve your servicing ability or your money will be refunded. You owe it to yourself to find out how you, too, can begin cashing in. Don't delay—send coupon today.

MANY MODELS AVAILABLE.

THERE IS A STETHOSCOPE to meet every need—to fit every pocketbook—from \$9.85 to \$89.95.

Manual Yours—Free

CONTAINS SERVICING HINTS AND TIPS.

A new, complete illustrated 28-page technical manual tells the inside story of an amazing new servicing method—also contains many valuable hints and kinks for every radio serviceman. Send 3c stamp to cover handling only—manual **FREE**.

DON'T DELAY! GET YOUR MANUAL TODAY!

**Feiler Engineering Co., Dept. 11H8
945 George St., Chicago 14, Ill.**

Please rush **FREE** manual "The Inside Story." I enclose 3c stamp for handling.

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Address

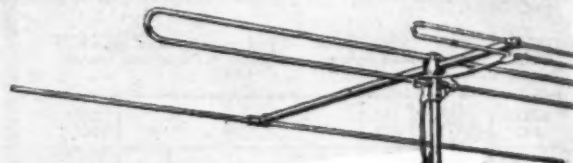
City State

FREE



AMPHENOL ANTENNAS

for every TV and FM requirement



TELEVISION ANTENNA ARRAY:
For complete and long-lasting television enjoyment, Amphenol Television Antenna, 114-005, is by far the best. Covers all channels in both high and low bands with high gain and complete freedom from unwanted side and rear responses. Perfect matching of full transmission line permits delivery of full signal strength to the receiver. It is rugged and weather resistant, eliminating costly repair and maintenance calls. It is packaged complete with mast, swivel base, guy clamp, all necessary hardware, and 75 ft. of Genuine Amphenol 300 Ohm Twin-Lead. Clear, concise instructions make it simple to install.
No. 114-005.....List \$27.50



DELUXE FM FOLDED DIPOLE ANTENNA:
Designed to provide perfect FM reception in areas of high and medium signal strength. This antenna is broadbanded over the entire FM range. The impedance is efficiently matched with the Genuine Amphenol 300 Ohm Twin-Lead which is included. Comes packaged complete with 75 ft. of transmission line and instructions for easy installation.
No. 114-001.....List \$12.25



DELUXE FM FOLDED DIPOLE AND REFLECTOR: The perfect solution for long distance reception. Essential for the suburban installation where a directional pattern is desired. Specially engineered for the finest FM reception and optimum gain throughout the entire FM band. Antenna is packaged complete with 75 ft. of Genuine Amphenol 300 Ohm Twin-Lead and instructions for easy installation.
No. 114-008.....List \$16.25



DELUXE FM ALL-DIRECTION DOUBLE FOLDED DIPOLE: Receives FM broadcasts from all directions. A perfectly engineered turnstile type, designed with the same precision as used in the FM station antenna. Reception is equally balanced around full 360° to bring in all FM stations within normal service radius. Packaged complete with instructions for quick, easy installation. Includes 75 ft. of Genuine Amphenol 300 Ohm Twin-Lead.
No. 114-010.....List \$16.25

Engineered electrically and mechanically in the Amphenol Antenna Development Laboratories.

AMPHENOL

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1830 SO. 34TH AVENUE
CHICAGO 30, ILLINOIS

Be sure to use **FREED** TELEVISION COMPONENTS for **DEPENDABLE** performance

TELEVISION TRANSFORMERS—Used in television receivers oscilloscopes, test equipment and high voltage, low current power supplies.

FREED NO.	HV AC VOLTS	DC MA	RECT V	RECT A	FIL V	FIL A	LIST PRICE
F-950	1700	4	2.5	2.5	6.3	.9	\$10.25
F-951	2000	2	2.5	1.75	6.3	.9	\$12.10
F-952	2500	2	2.5	1.75	6.3	.9	\$13.35

TELEVISION TRANSFORMERS—Used for a plate supply in television receivers (12 and 15 inch tube.)

FREED NO.	HV AC VOLTS	CT DC MA	RECT V	RECT A	FIL V	FIL A	LIST PRICE
F-960	775	225	5	3	6.3	1.75	\$14.80
F-961	800	300	5	3	5	6	\$30.75

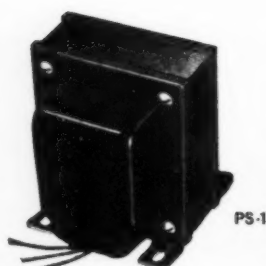
TELEVISION TRANSFORMERS

FREED NO.	DESCRIPTION	LIST PRICE
F-970	Horizontal Blocking Oscillator Tr.....	\$4.50
F-971	Vertical Blocking Oscillator Tr.....	\$4.25
F-972	Vertical Output Tr. for Magnetic Deflection CRT.....	\$8.50
F-973	Horizontal Output Tr. for Electrostatic Deflection CRT.....	\$4.50

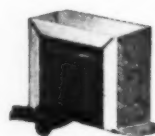
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Ask your Jobber. If he can't supply you—Order Direct from

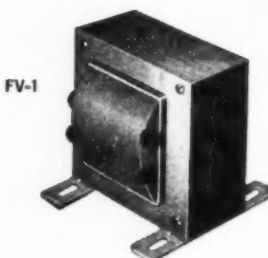
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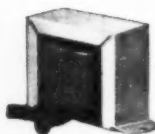
PS-1



CH-1

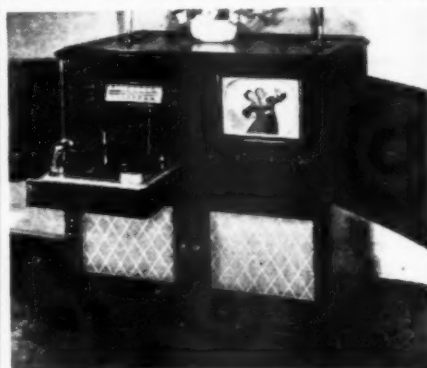


FV-1



CH-1

fidelity tone audio circuit with 5 watt beam power output. The automatic phonograph is installed on a slide-out panel for full-view record loading. The



record changer will handle either 10 or 12 inch records and shuts off when the last record has been played.

For complete information on the Model 585 write to *Emerson Radio & Phonograph Corporation*, 111 Eighth Avenue, New York 11, New York.

METAL TUBE UNIT

Starrett Television Corporation of New York has announced production on a television receiver using the new *Tel-O-Tube Corporation of America's* 16" metal television receiving tube.

Known as the "Ambassador," the new receiver is a table model unit housed in either a mahogany or walnut cabinet. Reception of the AM and FM bands is provided in addition to television coverage. The set measures 25½ inches by 27 inches by 24½ inches and is said to weigh substantially less than previous large tube sets because the metal tube weighs



one-sixth of the conventional glass tube.

A viewing surface of approximately 150 square inches is provided with this set.

For full details, write *Starrett Television Corporation*, 521 Fifth Avenue, New York, New York.

ARVIN TABLE MODELS

Distribution has started on the two latest additions to the *Arvin* line of table model radios, the 243T and the 253T series.

The 243T series is available in four colors, ivory, geranium red, banana yellow, and leaf green. The new series features seamless, mar-resistant metal cabinets, three tubes plus rectifier, and *Underwriters' Laboratories* listing.

RADIO & TELEVISION NEWS

new

IMPROVED

PATENTED

SOLDERING IRON TIP

Heating Time 9 Seconds • Guaranteed 6 Months

● Now better than ever, with newly designed longer neck to reach more tight spots. Amazing variety of uses for long period of time without breaking or "eating through". Sufficient heat generated to handle average soldering needs...eliminates need for heavier irons. Each electrode guaranteed for six months, except against misuse or breakage caused by carelessness.

Soldering iron tip (chrome plated to prevent heat loss)

65¢ each

At dealers and jobbers from coast to coast

CAL-PERRY

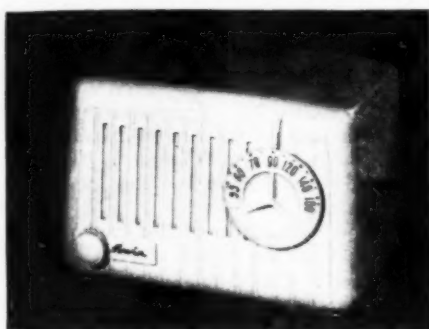
CORPORATION

62 Franklin Street

East Orange, N. J.

Dial calibration is carried on the tuning knobs and the volume control knob acts as an off-on switch. The series has a.v.c., beam power output, an a.c.-d.c. superheterodyne circuit, and a 20 foot extendable antenna.

The 253T series is available in ebony,



walnut, or ivory plastic cabinets. It has four tubes plus a rectifier. Controls are the same as with the 243T series.

Noblitt-Sparks Industries, Inc. maintains its factory at Columbus, Indiana for the manufacture of the Arvin line of receivers.

FARNSWORTH TV UNIT

Farnsworth Television & Radio Corporation of Fort Wayne, Indiana is making deliveries on the Model 651-P, a new television receiver housed in a cabinet of modern design.

This table model receiver is available in a dark walnut finish and measures 16 3/4" x 17" x 22 1/2". The set has a new type mirror-backed, flat-faced picture tube that assures a brilliant, steady, high definition image of 52 square inches. An exclusive feature of this set is an electronic beam "relaxor" which permits simplicity of electrical circuit design and more economical set maintenance and operation.

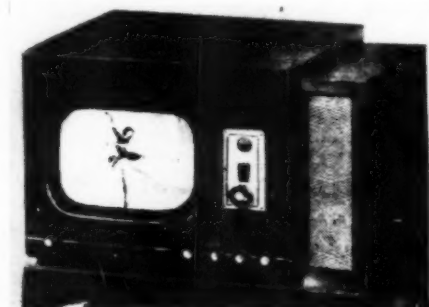
All operating controls are mounted on the front. The design also permits immediate access to all components in either the top or bottom of the chassis thus enabling service technicians to install and adjust the receiver to varying local conditions.

Farnsworth Television & Radio Corporation, Fort Wayne, Indiana will furnish additional details on request.

TABLE MODEL TV-FM

Stromberg-Carlson Company has added the Model TV 12 H1 to its line of table model receivers.

This television-FM receiver is housed



in a modern, pin-striped mahogany veneer cabinet. It features a twelve-

November, 1948

ACORN SPELLS \$SAVINGS\$

BRAND NEW MATERIAL • IMMEDIATE DELIVERY



TELEVISION BOOSTER

A "must" for every television set! Designed to improve all channel television reception. Will boost signals in weak areas and remote places to the power of local reception. Renders good contrast and definition where outdoor antennas are prohibited. Eliminates radiation causing interference to nearby television receivers. In handsome wood cabinet. 3 tubes. Shipping wt. 12 lbs.

\$16.95



SOUND POWERED MICROPHONE

Ideal for television service work. Complete with breast plate, strap and 20 feet of rubber covered shielded cable. Can be used as both mike and receiver. Perfect for two-way communication. Made by Western Electric for U.S. Navy. Shipping wt. 7 lbs.

Brand New \$7.50 each

AN-UG and AMPHENOL 83 Series Connectors in Stock Send Us Your Requirements

HEAVY DUTY POWER TRANSFORMER

Primary 110/220 volts 60 cycle. Secondary No. 1-410-0-410 at 400 mils. No. 2-6.3V at 3 amps. No. 3-4.9V at 13.5 amps. No. 4-5V at 3 amps. No. 5-2.5V at 1.7 amps. Dimensions 11-6 1/2" x 6 1/2" x 5 1/2". Made by G.E. for the U. S. Navy. Tremendous Value! Shipping wt. 39 lbs.

\$7.95

each

3 for \$21

POWER TRANSFORMERS

Primary 115V 60 cycle. Secondary 720V c.t. at 150 mils. 6.3V at 4 amps. 5V at 3 amps. Half shell mount, mounting centers 3 1/2" x 2 1/2". Weight 6 lbs. Real Value!

\$3.49

each

3 for \$10

Thordarson power trans., pri. 115V 60 cy., secondary 750V, c.t. at 145 mils. 6.3V at 4.5 amps. 5V at 3 amps. Upright mount. Wt. 7 lbs.

\$3.79

each

3 for \$11

Primary 115V 60 cycle. Secondary 600V c.t. at 100 mils. 6.3V at 3 amps. 5V at 3 amps. Half shell mtg. Mtg. centers 2 1/2" x 2 1/2". Dimensions 11-3 1/2" x 3 1/2" x 2 1/2". Wt. 6 lbs. Made by Thordarson. Specially priced!

\$2.95

each

3 for \$8.50

JENSEN 10" PM SPEAKER

Alnico V Magnet



Jensen "Standard Series" 110T ST 119. An excellent speaker for good quality radio sets or PA systems. Output undistorted 8 watts. Voice coil impedance 6-8 ohms.

A great

value at

\$4.69

TUNING CONDENSER



A terrific value at \$1.45 or 3 for \$4

A standard 3 gang 420 mmfd. per section condenser with push button tuning, ball bearing shaft gear driven. Shaft 2 1/8", h. 2 1/8". w. 1 1/8", d. 4 1/8". Wt. 2 lbs.

CARDWELL TUNING CONDENSER

1000 mmfd heavy duty with mica insulation and counterbalanced fly wheel drive. 1 1/2" shaft. Shipping wt. 4 lbs. List price \$14.85.

Our price \$1.49 3 for \$4



5 henary at 400 mils. 110 ohms DC. Hermetically sealed. High voltage insulation. Wt. 8 lbs.

\$3.49 each

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RHEOSTATS

Ohms	Watts	Ohms	Watts
15	25	35	50
50	25	150	50
50	25	10,000	50
75	25		
100	25		
300	25		
370	25		
500	25		
2500	25		
3000	25		
5000	25		
65c each			
50 for \$25.00			

6L6 OUTPUT TRANSFORMER

6L6 push-pull. 25 watts. 6000 ohms per plate to 6 ohm voice coil. Upright mounting. Mtg. centers 3 1/2". Weight 4 lbs.

\$2.45 each 3 for \$7

OUTPUT TRANSFORMER

Single tube to voice coil. Pri. 6000 ohms. Sec. 8 ohms. Hermetically sealed. Made by Chicago Transformer Co. for the Signal Corps. Mtg. centers 1-1/16" x 1-5/16". A real bargain! Weight 2 lbs.

69c each 4 for \$2.50

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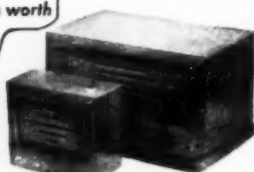
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Intercom Sub-Station Master Intercom Station, including 6-Tube Radio

Combines a top-quality 6 tube superhet receiver, plus office or home intercom system in handsome walnut-veneer cabinets. Hi-Amplification 3 tube intercom permits instant communication between radio-master and up to 4 remote sub-stations. Any remote station can call the master while radio is playing; call can be returned to any remote station. Operates on 110 volts AC or DC.

It's handsome—It's easy to install—It's easy to sell

Price Includes Radio Master, 1 Remote, 50' wire

Original retail price was \$84.50 with 4 remotes. Buy from RSE and SAVE OVER 50%.

Brand new—only 400 available.

\$29⁹⁵

Extra Remotes—\$3.95

MIDGET I.F. TRANSFORMERS

Back again—by popular demand!

RSE scores again with a new and better I. F. 400-500 KC range—1 1/4" square x 3" high—ceramic based mica trimmers—high gain iron cores—pep up old receivers, ideal for new construction—and now available in either input or output types—for peak performance! Individually boxed in the colorful RSE carton. List price \$2.10. LRI—input; LR2—output.

Specify Type.

Each	Matched Pair	Dozen	Egg Crate of 100
36c	69c	\$3.95	\$29.00



VOLUME CONTROLS

• Our own private brand—made by a nationally known manufacturer. • The same kind that net for \$1.09. • Noise-free carbon construction, standard shaft and bushing. • Individually boxed in our colorful carton carrying the RSE quality seal of approval. • Complete with switch, full range of sizes.

10 M ohms	100 M ohms	each	59c
15 M ohms	250 M ohms		
25 M ohms	500 M ohms	per 10	\$5.50
50 M ohms	1 Meg ohms	asstd.	
2 Meg ohms			
500 M Knurled Shaft			
500 M ohms less switch, 39c each, 100 for \$35.00			

TUBES

"The All-American Five"

Here they are—the fastest movers ever made—at RSE's long discount. Brand new, tested top-grades with regular RMA guarantee. Individually boxed in eye-appealing cartons. Know your supplier—his reputation. Shoot us an order to-day—watch your profits zoom to-morrow!

125A7GT...65 125K7GT...65 125Q7GT...59
3525GT...49 50L6GT...65
"All-American Kit", one each of above...\$2.98

ORDER INSTRUCTIONS
Minimum order—\$2.00. 25% deposit with order required for all C.O.D. shipments. Be sure to include sufficient postage—excess will be refunded. Orders received without postage will be shipped express collect. All prices F.O.B. Detroit.

RADIO SUPPLY & ENGINEERING CO., Inc.
89 SELDEN AVE. DETROIT 1, MICH.

inch picture tube and provides coverage of all television channels in addition to the 88-108 mc. FM band.

Known as the "Rochester," the new receiver has a 5 1/2 inch speaker system which is adequate for most television programs. In case symphonic or similar material is carried, provision has been made for connecting the set to a console radio or radio-phonograph to take advantage of the larger unit's audio and speaker system.

Further data on the "Rochester" may be secured from *Stromberg-Carlson Company*, Rochester 3, New York.

PORTABLE TV SET

Sentinel Radio Corporation of Evanston, Illinois has begun deliveries on a portable television receiving set.

This table-size set is capable of being carried from room to room, to the hospital bedside, to factory or office recreation room, college dormitories, summer homes, etc. wherever a.c. power line service is available.

The new portable unit has eye level vision, and a portable antenna. There is complete 4-knob control of channel, brightness, off-and-on volume and contrast. The case is an imitation grain leather, equipped with luggage type carrying handle.

For full details, write *Sentinel Radio Corporation*, Evanston, Illinois.



—30—

Communications Receiver

(Continued from page 61)

meter C_{21} for maximum "R" meter indication.

Tune the signal generator to approximately 4910 kc. The image should appear at this frequency. It may be necessary to increase the signal generator output for this test.

If the image does not appear at 4910 kc. tune the signal generator to 3090 kc. and it will. This condition will mean the oscillator is tuned on the low frequency side.

Should this condition exist retune the oscillator so the image falls on the high frequency side.

Next tune the mixer trimmer C_{10} for maximum "R" meter indication. The signal generator frequency should be 4000 kc. for this and all other adjustments.

Connect the signal generator to the grid of the first r.f. stage and adjust trimmer C_{10} for maximum indication. Connect the signal generator to the antenna terminals and adjust trimmer C_2 for maximum.

During these adjustments it will be necessary to continually reduce the output of the signal generator to maintain an "R" meter indication of R8 or less.

Final adjustment is made by connecting an antenna to the tuner and adjusting each circuit for maximum sensitivity on a weak signal.

The oscillator injection voltage can be checked by connecting a 20,000 ohm-per-volt voltmeter or vacuum tube voltmeter across resistor R_{11} in the mixer circuit. This voltage should run between one, and one and a half volts, for maximum conversion gain. The voltage can be adjusted by varying the value R_{11} . Increasing the resistance will cause the voltage to increase. Injection voltage is coupled from the oscillator to the mixer by tube capacity.

The over-all gain of the tuner is determined by the value of the first r.f. stage plate shunting condenser C_5 . If this capacity is decreased the gain will increase. Those desiring to increase or decrease the gain can do so by changing the value of this condenser. When this capacity is 100 μ fd. the following results are obtained; 2.4 microvolts with a 25 to 1 signal-to-noise ratio. The image rejection is 750 to 1.

The audio gain is reduced 5 to 1 by resistors R_4 and R_5 in the audio deck. If this voltage divider were removed the sensitivity would increase but the signal-to-noise ratio would decrease. Reducing the value of C_5 in the tuner will offer the same result. After a certain degree of sensitivity is reached, additional gain will only reduce the signal-to-noise ratio.

With the gain set as is and the volume control set at approximately 25 per-cent, a one watt audio level is available when received signals are above R3 meter indication. Fifty milliwatts is room volume.

Tuning Procedure—10 Meter Tuner

The tuning procedure for this tuner is much the same as the 75 meter tuner. Tuning i.f. line transformer L_1 is identical.

Frequency determining condensers C_1 , C_5 , C_{10} , and C_{21} are required to cover the 40 meter ham band. These condensers are ceramic 50 μ fd., soldered directly across the trimmer condensers. Condenser C_1 was shunted with an additional capacity of 10 μ fd. This may have been due to the tolerance of the 50 μ fd. condenser or a variation between coils.

After a tuner has been aligned the tension of the trimmer screw should be noted. If the screw is tight it is advisable to shunt the trimmer with an additional 10 μ fd. capacity and retune the circuit. This will reduce the amount of tension.

If the trimmer screw is loose after final adjustment the frequency determining capacity should be reduced and the circuit retuned.

The trimmer capacity is 30 μ fd. Increasing or decreasing the circuit capacity 10 μ fd. will correct this situation.

Connect the signal generator to the grid of the second r.f. stage and adjust the frequency of the generator to 7350 kc. Rotate the main tuning con-

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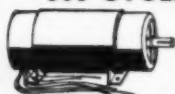
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1B24	4.95	217C	7.50	861	49.95	KU676	22.00	2A6	1.06	6S7G	1.28	12SQ7	.60		
1B27	4.95	218	4.95	864	.69	ML100	105.00	2A7	1.06	6S8GT	1.06	12SQ7GT	.60		
1B56	8.00	221A	2.95	865	2.95	ML101	150.00	2E5	.88	6SA7	.66	12SR7	.39		
1N21	.59	222A	120.00	866A	.99	ML1502	300.00	2V3G	1.98	6SA7GT	.66	12SR7GT	.39		
1N23	.59	227A	3.95	868	1.95	NK4	90.00	2X2A	1.25	6SC7	.72	12X3	.99		
1P24	11.50	241B	90.00	869H	75.00	OK50	39.50	3A4	.39	6SD7GT	.49	12Z3	1.06		
1P24	2.00	242C	5.95	872A	2.95	OK60	39.50	3A5	1.39	6SF5	.66	14A7 12B7	.88		
1S21	1.95	249C	3.49	874	2.49	OK61	39.50	3A8GT	1.98	6SF5GT	.72	14AF7 XXD	.88		
2AP1	3.95	250R	7.95	876	.98	OK62	39.50	3B7	.36	6SF7	.80	14B6	.88		
2B22	8.35	250TH	19.50	878	2.49	REL 21	4.25	306	.36	6SG7	.80	14B8	.88		
2C22	.39	250TL	19.50	879	.89	RK12	1.95	304	.88	6SH7	.39	14C5	.88		
2C26A	.75	252A	4.95	884	1.49	RK21	3.95	305GT	.96	6SJ7	.66	14C7	.88		
2C34	.59	259A	4.95	885	.98	RK22	4.95	354	.80	6SJ7GT	.66	14E4	.72		
2C40	1.98	274A	1.25	902P1	7.95	RK25	2.95	3V4	.81	6SK7	.66	14E7	.88		
2C43	7.50	274B	1.25	905	11.95	RK33	.98	5A24	1.50	6SK7GT	.66	14F7	.88		
2C44	4.95	282A	4.95	912	2.95	RK34	.59	5R4CY	1.15	6SR7	.66	14F8	1.06		
2C46	7.50	301A	4.95	923	.98	RK59	3.95	5T4	1.28	6SN7GT	.88	14H7	.88		
2D21	1.69	304TH	6.95	931A	4.95	RK65	24.95	5T4G	.60	6SO7	.60	14I7	1.06		
2E22	1.50	304TL	1.49	950	1.06	RK60	.79	5V4G	.96	6SO7GT	.60	14N7	1.06		
2E24	4.95	305A	12.95	953H	4.95	RK69	49.50	5W4	1.06	6SR7	.72	14O7	.88		
2E25	4.25	307A	4.95	954	.75	RK72	1.95	5W4GT	.66	6SR7GT	.72	14R7	1.06		
2E26	3.95	310A	4.95	955	.75	RK73	3.95	5X4G	.66	6S87	.66	14S7	.88		
2E30	2.49	311A	1.98	956	.75	RK75	6.25	5Y3GT	.42	6SV7	.88	14W7	1.06		
2J21A	14.95	316A	.69	957	.75	RK120	10.00	5Y4G	.60	6U5 6G5	.72	14X7	1.06		
2J26	14.95	322A	120.00	958A	.75	TZ40	2.95	5Z3	.72	6U7G	.72	14X4	.88		
2J31	24.95	327A	4.95	959	.75	UX6653	3.95	5Z4	1.06	6V6	1.28	14Y4	.88		
2J32	24.95	331A	4.95	961	.69	V70D	6.95	6A3	.89	6V6GT	.80	19	1.28		
2J33	24.95	338A	4.95	1000 SPEC.	24.95	VR75	.75	6A6	1.06	6W7G	.88	19T8	1.06		
2J34	24.95	350 A B	2.95	1000T	75.00	VR78	.75	6A7	.80	6X4	.22	22	1.28		
2J37	24.95	353A	4.95	1608	9.95	VR90	.75	6A8	.89	6X5GT	.96	24A	.88		
2J38	37.50	368AS	4.95	1611	.99	VR91	1.49	6A8GT	.80	6Y6G	.96	25A7GT	1.16		
2JB51	4.95	371A	2.95	1613	.75	VR92	.75	6A87 1853	1.06	6ZY5G	.88	25AC5GT	1.16		
2J54B	25.00	371B	1614	1614	1.39	VR105	.75	6AC5GT	1.16	7A4 XXL	.72	2516GT	.66		
2K25	24.95	388A	4.95	1616	1.39	VR150	.98	6AC7 1852	1.16	7A5	.72	25Y5	1.16		
3AP1	4.95	393A	7.95	1619	.75	VT127A	3.00	6AD7G	1.28	7A6	.72	25Z5	.60		
3B22	4.95	394A	4.50	1621	1.98	VU111	1.19	6AG5	1.06	7A7	.72	25Z6GT	.60		
3B23	4.95	417A	24.95	1622	1.75	W1460	14.95	6AG7	1.28	7A8	.72	26	.72		
3B24	1.95	434A	3.95	1624	1.75	W1468	14.95	6AH6	3.99	7A97	1.06	27	.60		
3B25	1.25	446A	1.95	1625	.49	W1532A	4.95	6AJ5	.99	7B7	.72	28D7	.39		
3B26	5.95	450TH	24.95	1626	.49	W1562	150.00	6AK5	1.56	7AG7	.88	30	.39		
3BP1	3.95	503	195.00	1527	7.95	W1616	105.00	6AK6	.96	7AF7	.88	31	.39		
3C21	5.95	527	12.95	1628	4.95	W1619	49.50	6AL5	.80	7B4	.72	32	1.28		
3C22	12.95	531	24.50	1629	.69	Z225	1.95	6AL7GT	1.06	7B5	.72	32L7GT	1.28		
3C23	4.95	575A	14.95	1630	7.50	0A2	1.69	6AO6	.72	7B6	.72	33	.39		
3C24	1.69	701A	4.95	1638	.98	0A3 VR75	.98	6AO7GT	.88	7B7	.72	34	.39		
3C30	3.00	702A	3.95	1641	.79	0B2	2.05	6ARS	.66	7B8	.72	35 51	.80		
3CP1	3.95	703A	4.95	1642	.98	0B3 VR90	.75	6AS5	.80	7C4 1203A	.39	35A5	.72		
3BP1	3.95	704A	1.98	1644	1.49	0C3 VR105	.75	6AT6	.66	7C5	.72	35B5	.80		
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4-65A	14.50	707A B	24.95	1852	1.06	074G	.88	6B5	1.56	7E6	.72	35Z3	.72		
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4A10	6.95	714AY	14.95	2140	20.00	1A4P	1.56	6BA6	.72	7H7	.80	37	.39		
4B24	4.95	715A B	9.95	5514	4.95	1A5GT	.72	6BE6	.72	7J7	1.06	39 44	.39		
4C35	19.95	715C	24.95	5516	5.95	1A5	1.28	6BE6G	1.92	7K7	1.06	41	.66		
4J26	10.00	717A	34.95	5562	10.00	1A7GT	.80	6BG6	.80	7L7	.88	42	.66		
4J33	49.50	721A B	34.95	8003	5.95	1B4	1.56	6B16	.80	7M7	.88	43	.66		
5AP1	5.95	723AB	7.95	8005	4.95	1B5 25S	1.28	6C4	.39	7O7	.72	45	.66		
5AP4	5.95	724A B	4.95	8008	3.75	1C5GT	.88	6C5	.66	7R7	.88	45Z5GT	.72		
5BP1	2.95	725A	24.95	8011	2.95	1C6	1.28	6C5GT	.66	7S7	1.06	46	1.06		
5BP4	4.95	726A	4.95	8012	2.95	1C7G	.88	6C6	.66	7V7	1.06	47	.96		
5CP1	3.95	727A	49.50	8013	2.95	1D5G	1.56	6D6	.66	7W7	1.06	50A5	.88		
5GP1	9.95	800	2.25	8016	1.49	1D5GP	1.56	6D8	.66	7X7 XXFM	1.06	50B5	.66		
5LP1	11.95	801A	.98	8020	3.95	1D7G	1.28	6D8G	1.28	7Y4	.72	50L6GT	.66		
6AF6G	.88	802	2.95	8027	7.95	1D8GT	1.56	6E5	.85	7Z4	.72	50Y6GT	.72		
6C21	24.95	803	8.95	8027	12.95	1E7GT	1.56	6F5	.66	12A	.60	53	1.06		
6C4	3.95	804	12.95	8027	12.95	1F4	1.06	6F5GT	.66	12A6	.39	56	.72		
6G5G	1.25	805	5.95	8027	12.95	1F5G	1.06	6F6	.80	12A6GT	.39	57	.80		
7BP7	4.95	806	17.50	8027	12.95	1F6	1.56	6F6GT	.66	12A7	1.28	58	.80		
7EP4	17.95	807	1.25	8027	12.95	1F7G	1.56	6F7	1.06	12A8GT	.80	70L7GT	1.56		
7GP4	19.40	808	2.95	8027	12.95	1G4GT	1.06	6F8G	1.28	12A8GT	.88	71A	.88		
9GP7	15.00	809	2.95	8027	12.95	1G6GT	1.06	6G6G	1.06	12A9	.88	75	.66		
9LP7	4.95	810	2.95	8027	12.95	1H4G	.88	6H6	.66	12AT6	1.06	76	.66		
9MP7	14.95	811	2.45	8027	12.95	1H5GT	.66	6H6GT	.60	12AT7	.80	77	.66		
10BP4	34.95	812	2.95	8027	12.95	1H6GT	1.28	6J5	.54	12A8	.80	78	.66		
10HP4	49.50	812H	6.90	8027	12.95	1J4GT	1.28	6J5GT	.54	12A9	.80	79	.88		
10Y	.69	813	8.95	8027	12.95	1J6GT	.80	6J7	.80	12B6	.72	80	.46		
10 SPEC	.69	814	3.95	8027	12.95	1L4	1.06	6J7GT	.80	12B6GT	.72	81	1.56		
12DP7	14.95	815	1.19	8027	12.95	1L6	1.06	6J8G	1.28	12B8GT	.72	82	1.06		
12GP7	14.95	816	1.19	8027	12.95	1L8	1.06	6K5GT	.96	12H6	.39	83	1.06		
12JP4	60.00	822	11.95	8027	12.95	1L9	1.06	6K6GT	.60	12J5GT	.39	84	1.06		
15AP4	125.00	826	.69	8027	12.95	1L10	1.06	6K7	.66	12J7G	.80	85	1.28		
15E	1.50	827R	99.50	8027	12.95	1L11	1.06	6K7GT	.66	12J7GT	.80	86 624	.72		
15R	1.50	828	6.95	8027	12.95	1L12	1.06	6K8	.66	12K7GT	.66	87	.88		
20AP4	270.00	829 A B	7.95	8027	12.95	1L13	1.06	6K8GT	.96	12K8	.88	89	.72		
23D4	.49	829B 3E29	4.95	8027	12.95	1L14	1.06	6L5G	1.06	12K8GT	.96	89Y	.39		
45 SPEC	.49	830	2.95	8027	12.95	1L15	1.06	6L6	1.42	12Q7GT	.72	117L7GT	1.56		
75TL	3.95	830B	5.25	8027	12.95	1L16	1.06	6L6GT	1.16	12SA7	.66	117M7GT	1.56		
100															

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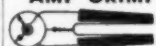


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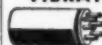
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case. Fits GE port-
able radio. Brand
new. **\$1.49**
Ea.

VIBRATOR FOR PE-125



Here's the vibrator
for the PE-125 power
supply used with the BC-223
transmitter. **\$1.49**
Brand new. Ea.

CD-508 CORD



Has PL-68 and 7' 3 wire
cord. Also SW-141 and
JK-48 jack. **29c**
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Features:—110 volt 60 cycle—variable speed
—4 tone crackle console—selsyn indication—
supports 250 lb. beam—weatherproofed—90
day guarantee. Hundreds **\$69.95**
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DICK ROSE ERECO
2912 Hewitt Ave. Everett 20, Wash.

denser to minimum capacity position.
Adjust oscillator trimmer C_2 for
maximum "R" meter deflection.
Change the frequency of the signal
generator to approximately 8260 kc.
making sure the image appears on the
high frequency side.

Return the frequency dial of the
signal generator to 7350 kc. and ad-
just mixer trimmer for maximum.
Connect the generator to the grid of
the first r.f. stage and adjust the sec-
ond r.f. stage trimmer C_{10} for max-
imum. Next connect the generator to
the antenna winding and adjust the
first r.f. stage trimmer C_1 for max-
imum.

Final alignment is made by connect-
ing an antenna to the tuner and ad-
justing all circuits for maximum sen-
sitivity on a weak signal.

The gain of this tuner is governed
by the first r.f. stage plate shunt con-
denser C_5 . The gain may be increased
or decreased by changing the value
of this condenser.

Coil difficulties were experienced in
this tuner. A connection diagram is
supplied with each Miller coil. This
diagram shows grid, plate, "B plus,"
and a.v.c. terminals. Following this
diagram resulted in an r.f. gain of
less than one for each stage. By re-
versing the plate and "B plus" leads
the gain was normal.

Connect the coils as the circuit dia-
gram supplied with the coils indicates.
If the stage appears to have no gain
reverse the plate and "B plus" leads.
It will only take a minute to make this
change if necessary. This statement
holds true for all tuners.

The sensitivity of this tuner is 1.5
microvolts with a signal-to-noise ratio
of 25 to 1. The image ratio is 2200
to 1.

Tuning Procedure—20 Meter Tuner

The tuning procedure for this tuner
is identical to the 40 meter tuner. The
signal generator frequency for align-
ment should be 14,600 kc. with the
main tuning condenser set at min-
imum capacity. The image frequency
will be 15,510 kc.

The sensitivity is 2.7 microvolts with
a signal-to-noise ratio of 25 to 1. The
image ratio is 180 to 1.

In this tuner the plate shunt con-
denser C_5 is omitted. As the frequency
is increased the r.f. gain per stage de-
creases.

The value of resistor R_{11} in the 20
meter tuner is 4700 ohms. In the 75
and 40 meter tuners the value is 25-
000 ohms. The grid rectification of the
mixer stage due to the injection volt-
age furnishes bias for the mixer stage
allowing the cathode connection to
ground.

The r.f. amplifier tubes in the 75, 40,
and 20 meter tuners are 6SK7 type.
6SG7 tubes are used in the 10 meter
tuner. The higher gain tubes make up
for the reduction of gain due to the
increase in frequency.

The gain can be increased in the
lower frequency tuners by using 6SG7
instead of 6SK7 type tubes. The socket

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20 Ga. stranded flexible plastic in-
sulated wire, black only . . .

1000 ft. spools ONLY . . . **\$3.25**

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chassis, hard-
ware, solder,
circuit dia-
gram, etc. **\$11.95 ea.**



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Excellent for ARC/5
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150 ma. 6.3v 2.5a.
6.3v 1.6a.
5v3a; 115v
50-60c pri. **\$4.89 ea.**



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115v 50-60 c
pri. 7000
volt insula-
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Checks gain. All parts including case,
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WALKER 5-9642

connections are the same if number 3 and 5 tube socket connections are wired together per the wiring diagram.

A test was made using 6SG7 r.f. tubes in the 20 meter tuner. The sensitivity increased from 2.7 to 1 microvolt. The signal-to-noise ratio decreased from 25 to 1, to 12 to 1.

Reception of weak signals improved when the signal-to-noise ratio was 25 to 1 although the actual sensitivity was less. The builder can make this test and satisfy himself there is such a thing as too much gain if the same signal-to-noise ratio is not maintained.

Tuning Procedure—10 Meter Tuner

The tuning procedure for this tuner is the same as the other tuners. The alignment frequency is 29,800 kc. and the image frequency is 30,710 kc.

The sensitivity is 1 microvolt with a signal-to-noise ratio of 25 to 1. The image ratio is 120 to 1.

The image ratio of a single r.f. stage at 29,000 kc. may be in the order of 10 to 1.

It will be noted that the image ratio of each tuner does not change uniformly between tuners. This is due largely to the different values of frequency determining capacities shunting the grid coils.

Antenna Connections

The antenna terminals are available at the rear of each tuner chassis. Those desiring optimum operating conditions may connect antennas at this point. Those having individual antennas for each band will undoubtedly improve reception on the higher frequency tuners.

The antenna switch in the main tuner is a compromise between ease of operation and some attenuation in the antenna circuit due to mismatch of transmission lines and switch.

The operator can decide for himself by connecting the antenna through the switching network and directly to the tuner. If the attenuation is less than one "R" in either case, the switching losses are sufficiently low to disregard.

If the antennas are connected directly to the tuners disconnect the antenna lead going to the all-wave tuner switching network.

Dial Calibration

The National MCN dial is extremely simple to calibrate. The plastic pointer has three small holes drilled in it. By using one of these holes as a guide, a needle is used to make each calibration point. Three paper dial scales are furnished with each dial. This means the builder has three chances to make a neat dial calibration.

If the first dial lettering is not satisfactory another dial can be made without recalibrating. Simply place the unsatisfactory dial over a blank dial scale and mark the new dial by forcing the needle point through the first dial calibration points.

First make sure the tuner to be cali-

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\$49.50

Complete with 8 Tubes

For magnificent, high fidelity reproduction and precision tuning this new FM Tuner is superb! Plugs into AM radio or amplifier. Frequency response 50-15,000 cps ± 1 db. Ingenious GE "Guillotine" tuning gives high gain and circuit stability. Excellent sensitivity—ideal for distant FM stations or in "fringe" areas. Covers 88-108 Mc. Tropic-proofed thruout! Universal 6-tap

power transformer for operation on 103-260 volts, 50/60 cycles AC in 6 steps. Built-in antenna and input for 300 ohm folded dipole. Beautiful hand-rubbed walnut cabinet, 12" dial. Tunes smoothly, easily. 15 1/4 x 10 3/4 x 11 1/2" D. Complete with 8 tubes. Shpg. Wgt. 30 lbs. No. A302.



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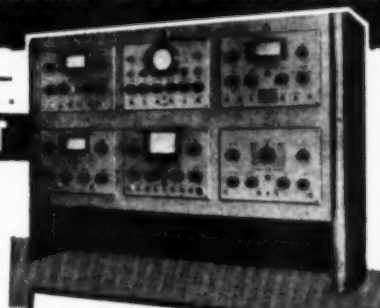
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This is the "last word" in TV Service . . . It makes available to you the latest designs in Television Test Equipment to get top performance from the kit you assemble. You can do a complete job of Alignment and Testing under the guidance of a Trained Television Technician.

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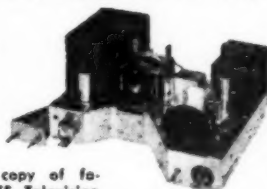


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\$198.50

Complete with 30 RCA Tubes including 10BP4



This is exact copy of famous RCA 630TS Television set. Contains efficient RCA front and 13-channel tuner — completely factory wired and aligned. Can substitute 12" or 15" tube for 10BP4 if desired. Dual controls for picture and FM sound, and for horiz. and vert. control. Kit supplied complete with 30 RCA matched tubes, and RCA schematic and service manual, but less wire, solder, and mtg. screws. Shpg. wt. 85 lbs.

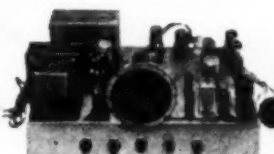
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\$39.70 down, 12 months at \$14.03

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Cover all 12 TV channels. High and Low frequency arrays use hairpin dipole and reflector elements. 5-ft. alum. mast with hdwre. and instructions. Wgt. 10 lbs.

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5-ft. Extension Mast and coupler for above

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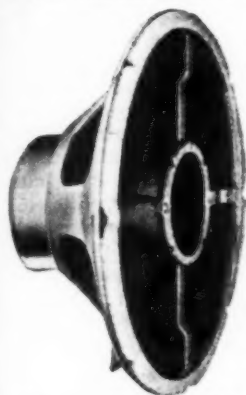
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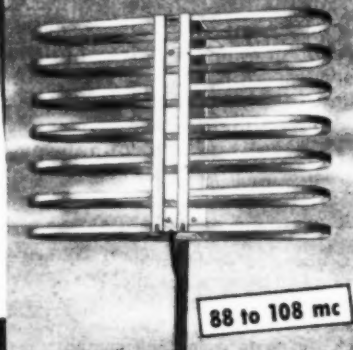
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88 to 108 mc

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- Low Standing Wave Ratio
- High Sensitivity & Signal Strength
- All-Aluminum Construction

Has virtually circular horizontal directivity at 88 mc; only slight elongation appears at 108 mc. Affords maximum noise-reducing benefits.

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The first and only FM receiving antenna with all these features: 1. Non-Directional Pickup over the entire FM band—for satisfactory reception from all stations in any location regardless of direction of signal. 2. Higher gain for improved reception at outlying sections of the effective station area. 3. Stable Omni-directional characteristics—unaffected by rain, sleet or age. 4. Can be permanently grounded for protection against lightning. 5. Direct match to standard 300 ohm receivers. 6. Complete with 5-foot mounting mast, adjustable base and hardware. (Also available less mounting mast and base, as Model 150—ideal for use in pairs for increased signal strength and lower noise.)

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425 to 750 MCS.: Contains 10 tubes: (1) 807; (2) 703A; (2) AG7; (2) 6AG7; (2) 5R4GY; (1) 2X2; (1) 931A. Unit has blower motor and 400 cycle pwr supply complete with all tubes, etc. Easy to convert for many uses.

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PEAK ELECTRONICS CO.
188 WASHINGTON STREET, DEPT. MR
NEW YORK 7, N. Y.

Sweep Generators

(Continued from page 48)

voltage of the scope itself and adjust the fine-frequency control (on the scope front panel) until a stable pattern is obtained.

The sweeping rate in nearly all sweep generators is 60 times a second, set by the local power line.

It was stated at the outset of this discussion that sweep generators designed for television sets used either a sinusoidal or a single saw-tooth sweep. Now, many of the sweep generators designed for AM and FM set alignment use the double saw-tooth sweep shown in Fig. 13 and yet none of the television sweep generators have this common type of sweep. The reason is due to the non-symmetrical response pattern that is characteristic of video i.f. systems. See Fig. 14. The double saw-tooth sweep produces a double pattern on the screen and by using this sweep, we would obtain either the double pattern shown in Fig. 15A or the double pattern shown in Fig. 15B. In either instance, the serviceman would be hampered in his alignment work. Hence, only sinusoidal and single saw-tooth driving voltages are employed in TV sweep generators.

That a double image or pattern is produced when a double saw-tooth driving voltage is employed can best be illustrated by an example. Suppose that in a generator employing this type of sweep voltage we set the front panel dial for a mid-frequency of 23 mc. with an over-all sweep of 6 mc. This means that the generator signal output will go from a low of 20 mc. to a high of 26 mc. In one complete cycle, the signal generator will go through this range twice, as shown in

Fig. 13. Now, if the circuit being aligned possesses the response curve shown in Fig. 14, two complete patterns will appear on the scope screen. The patterns may appear side by side, as in Fig. 15A, or else superimposed, as in Fig. 15B. The first double pattern, Fig. 15A, will be obtained if the beam in the scope moves at one-half the frequency of the double saw-tooth wave. On the other hand, Fig. 15B will appear when the beam moves at a frequency equal to twice the double saw-tooth wave. In the latter case, one pattern is traced out, then the beam retraces rapidly to the left-hand side of the screen and the second pattern is traced out. When the response curve of the circuit under test is symmetrical, both curves blend together. However, because we have a non-symmetrical pattern in television i.f. systems, the two patterns can not be made to blend.

The following facts, in summary, should be kept in mind when using sweep generators with television receivers.

1. Determine the type of driving voltage employed in the sweep generator.
2. If it is sinusoidal, do *not* use the internal deflection system of the scope itself. Instead, obtain a sinusoidal voltage from the generator and connect this to the horizontal input terminals of the scope.
3. Adjust the phase control to obtain a single pattern.
4. When the generator uses a single saw-tooth wave, the internal deflection voltage of the scope can be used to drive the beam across the screen. In this case, the serviceman may tap off some of the saw-tooth voltage from the generator and apply it to the scope terminals marked "EXT. SYNC."

—30—

Captain R. J. "Mike" Gibbons, a senior pilot for United Air Lines, and Robert W. Ellis, chief of mechanical service for the company at Seattle, both amateur radio operators, often get together off-duty to contact hams within the company. Since the two are neighbors, Captain Gibbons frequently stops by after a late trip to pick up news along the company's short-wave grapevine.



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4" PM Speaker	\$1.25
5" PM Speaker	1.25
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1/2 meg with switch... 3 for 99c

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Balance C.O.D. —F.O.B. Chicago
Prices Subject to Change Without
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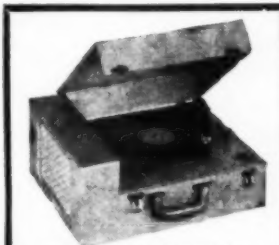
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All new tubes, 100% guaranteed, individually boxed.

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02A	.80	305GT	.85	6R7G	.65	6V7G	.96	7F7	.80	33	.96
1A3	.80	3S4	.72	6S7G	1.15	6W7G	.96	7F8	.96	34	.96
1A4P	1.40	5R4GY	1.15	6S8GT	.80	6X5GT	.54	7G7	.96	35	.72
1A5GT	.85	5T4	1.40	6S8GT	.80	6Y6G	.85	7H7	.80	35A5	.65
1A6	1.15	5U4B	.54	6S8GT	.85	6Y7G	1.15	7J7	.96	35L6GT	.60
1A7GT	.72	5V4G	.85	6S8GT	.72	6Z5	1.15	7L7	.80	35W4	.45
1B4P	1.40	5X1G	.85	6S8GT	.65	6Z7G	1.40	7N7	.80	35Y4	.65
1B5/25S	1.15	5Y3GT	.45	6SF5	.65	6Z9G	.80	7Q7	.65	35Z5GT	.45
1C5GT	.80	5Y4G	.54	6SF7	.72	7A4	.65	7V7	.96	36	.96
1C6	1.15	5Z3	.65	6SG7	.72	7A5	.65	7W7	.96	37	.65
1C7G	1.15	5Z4	.96	6SH7/GT	.80	7A6	.65	7X7	.96	38	.80
1D5GP	1.40	6A3	.96	6S17/GT	.60	7A7	.65	7Y4	.65	39	.96
1D7G	1.15	6A4 LA	1.15	6SK7 GT	.60	7B3	.65	7Z4	.55	40	.80
1D8GT	1.40	6A6	.96	6SL7GT	.85	7B6	.65	12A	.65	41	.60
1E5GP	1.40	6A7	.72	6SN7GT	.80	7B7	.65	12A5	1.15	42	.60
1E7G	1.40	6A8GT	.72	6SQ7 GT	.54	7B8	.65	12A6	.96	43Z3	.65
1F4G	.96	6A8T	1.15	6SR7	.65	7C4	.96	12A7	.96	43Z5GT	.65
1F5G	.96	6AC7	.96	6U5G	.72	7C5	.65	12A8 GT	.72	44	.96
1F6	1.40	6AD7G	1.15	6U6GT	.65	7C6	.65	12AH7GT	.96	47	.65
1F7	1.40	6AE5GT	.80	6U7G	.65	7C7	.65	12AT6	.65	50	1.40
1G4GT	.96	6AF6GT	.96	6V6	1.15	7E6	.65	12BA6	.65	50A5	.80
1G5G	.96	6AG5	.96					12B6	.65	50B5	.72
1G6GT	.96	6AG7	1.15					12C8	1.15	50L6GT	.60
1H4G	1.15	6AK5	.96					12F5	.65	50X6GT	.60
1H5GT	.80	6B4G	.96					12H6	.65	51	.96
1H6G	1.15	6B7	1.15					12J5GT	.54	56	.65
1J6G	.96	6B8G	1.15					12J7GT	.72	57	.72
1L4	.72	6C4	.60					12K8	.85	58	.72
1LA4	.96	6C5 GT	.72					12Q7	.65	70L7	1.15
1LB4	.96	6C6	.60					12SA7GT	.65	71A	.72
1LC5	.96	6C8G	.96					12SC7	.80	75	.60
1LC6	.96	6D6	.60					12SF5	.65	76	.60
1LD5	.96	6E5	.80					12SF7	.72	77	.60
1LH4	.96	6F5GT	.60					12SG7	.72	78	.60
1LN5	.96	6F6	.72					12SH7	.80	79	.96
1NSGT	.72	6F8GT	1.15					12S17	.65	80	.45
1N6G	.85	6F7	1.15					12SK7/GT	.60	81	1.40
1Q5GT	.96	6F8G	1.15					12SL7GT	.85	82	.96
1R4	.96	6G6G	.96					12SN7GT	.80	83	.80
1R5	.72	6H6 GT	.60					12SQ7/GT	.54	83V	1.15
1S4	.85	6J5 GT	.54					12SR7	.80	84	.96
1S5	.72	6J6GT	.72					14A7	.80	85	.80
1T4	.72	6J7GT	.72					14B6	.80	89	.80
1T5GT	.96	6J8G	.96					14Q7	.80	117L7GT	1.15
1V	.80	6K6GT	.54					14R7	.80	117P7GT	1.40
2A3	1.15	6K7	.60					25L6GT	.60	117Z3	.65
2A4G	1.15	6K8	.85					25Z5	.54	117Z6GT	.95
2A5	.80	6L5G	.96					25Z6GT	.54	VR-90	.96
2A6	.96	6L6GA	1.15					26	.65	VR-105	.96
2B7	.96	6L7GT	.96					26A7	1.15	VR-150	.96
2X2/879	1.15	6N5	.80					27	.54	9001	.98
3A4	.72	6N7	.85					30	.72	FM1000	1.15
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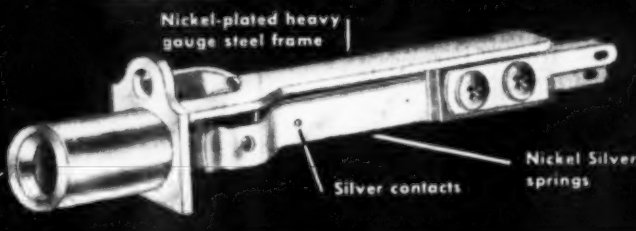
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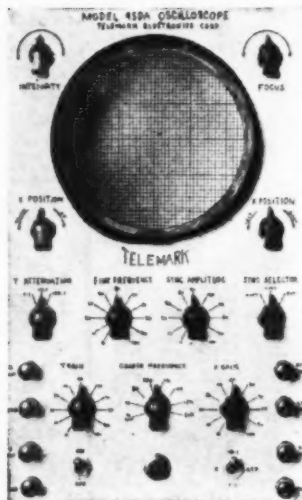
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Technical BOOKS

"ELECTRIC EYE CIRCUITS AND RELAYS IN THEORY AND PRACTICE" by A. Edelman. Published by Eby Specialty Sales Co., New York. 36 pages. Price \$1.00 paper.

For years servicemen have been augmenting their income by building, installing, and servicing photoelectric relay equipment. Undoubtedly more of these technicians could enter this lucrative field with suitable training.

This book answers many of the questions about electric eyes that the engineer, electrician, technician, serviceman, inventor, experimenter, and student have been asking for many years. The text covers such subjects as light sensitive elements, light projectors, optical systems, photoelectric amplifiers, relays, stability, permanence, maintenance, power supplies, and typical photorelay circuits. The discussion has been confined solely to photoelectric devices.

Fifty diagrams have been used to illustrate the text material. A variety of circuits have been diagrammed covering various operating conditions and applications.

The book is written in non-technical, easy-to-understand language and should prove of value to persons interested in the rapidly expanding field of photoelectric equipment.

"LISTENING" by Albert N. Williams. Published by The University of Denver Press, Denver. 152 pages. Price \$2.75.

This book is a compilation of a series of essays by one of broadcasting's most interesting and interested critics.

For years Mr. Williams has been "the voice crying in the wilderness" although now many columnists have entered the field as "radio critics." These essays while not unfriendly manage to hang the sword of public censure over the heads of the broadcasters by a very delicate thread.

Much of the material is howlingly funny but the point under discussion is well made and the quip doesn't detract from the question. Readers seeking technical information on radio won't find it here, but the listener, which means most of us, will find plenty of meat to digest for the future of radio is hanging in the balance whether we like to admit it or not.

"ELECTRON-OPTICS" by Dr. Paul Hatschek, translated by Arthur Palme. Published by American Photographic Publishing Company, Boston. 180 pages. Price \$3.50. Second Edition.

This is a fundamental text on the science of electronics written for the layman and the student. No mathematical knowledge is required to understand the author's complete and simplified explanation of such phenomena as electricity flowing in a

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Two new chapters dealing with later developments and the shape of things to come have been added by the translator and Dr. Walter Hausz of *General Electric Company*.

The text is well and interestingly written and persons seeking a "speaking" acquaintance with electronics are invited to investigate this book. Numerous line drawings and photographs add clarity to the textual presentation.

-50-

MIDWEST VIDEO NET

NETWORK television reached the Midwest late in September with St. Louis, Chicago, Milwaukee, Toledo, Detroit, Cleveland, and Buffalo linked by Bell System coaxial cables and radio relay systems.

By the end of the year, the Midwestern network will be linked to the East Coast Network, making it possible for one program to be broadcast by television stations connected to the hook-up from the Atlantic Coast to the Mississippi River.

Service is provided in both directions between St. Louis, Chicago, Toledo, Detroit, and Cleveland and branches carry programs to Buffalo and Milwaukee. The television channels are furnished by coaxial cables, with the exception of the Toledo-Detroit and Chicago-Milwaukee links where radio relay systems are employed.

Work on the coaxial cables in the Midwestern network began in May, 1946, with the laying of the Buffalo-Cleveland cable. The Terre Haute-St. Louis cable project was started before the war but its completion was delayed until 1945.

Work on the Chicago-Terre Haute and Cleveland-Toledo sections was begun in February, 1947. In August of that year, the Chicago-Toledo segment was started. All cable segments have been in use for long distance telephone service for some months, while additional channels were being equipped for television transmission.

Construction of the radio relay systems in the network was begun during the spring of this year. Three intermediate towers were built between Chicago and Milwaukee and two between Toledo and Detroit. Terminal equipment was installed at the Michigan Bell Telephone Company building in Detroit, the Ohio Bell Telephone Company building in Toledo, the Illinois Bell Telephone Company's long distance center in Chicago, and at the Wisconsin Telephone Company toll building in Milwaukee.

The Eastern television network now in operation includes Boston, New York, Philadelphia, Baltimore, Washington, and Richmond. The New York-Boston route is radio relay, the remainder is coaxial cable.

-50-

November, 1948

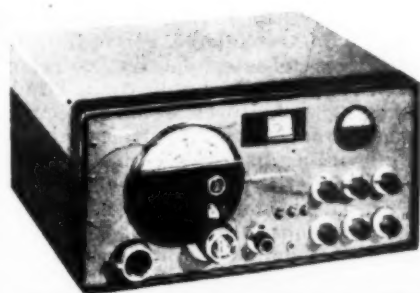
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Manufacturers' Literature

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BROADCAST EQUIPMENT

Federal Telecommunication Laboratories, Inc. has just issued five new data sheets covering three radio links and two pieces of broadcast test equipment.

One pamphlet covers the FTL-10-A 23 voice channel radio link system which is designed primarily for use as a simplex or duplex telephone circuit. The system uses the pulse-time method of modulation with time-division multiplex. The primary carrier of energy is a microwave radio frequency signal utilizing highly directed beams. This publication covers overall operation, general characteristics, terminal equipment, radio frequency equipment, antenna equipment, auxiliary equipment, and installation information. This data sheet has been designated "Radio Links 1."

The second publication, "Radio Links 2" deals with a frequency modulation u.h.f. radio link and covers special features, general details, receiver, transmitter, mechanical equipment, antenna, and technical characteristics. The unit is designated the FTL-11-A.

The FTL-13-A frequency modulation u.h.f. broadband radio link for multichannel telephone service is covered in the third publication, "Radio Links 3." Features, general applications, transmitter, receiver, antenna, application diagrams, and technical characteristics are discussed.

The two publications dealing with test equipment cover the FTL-15-A all-metal dummy antenna for FM broadcast transmitters and the FTL-12-A, a television broadcast transmitter monitor. These pamphlets have been designated "Test Equipment 1" and "Test Equipment 2" respectively.

Copies of any or all of these data sheets may be secured by writing Federal Telecommunication Laboratories, Inc., 67 Broad Street, New York 4, New York. Please request these publications by pamphlet designation and equipment number.

MINIATURE TUBES

A new folder cataloging the complete RCA line of miniature electron tubes has been prepared by the Commercial Engineering Section of the RCA Tube Department and is now available for distribution.

Covering 64 miniature types, the new folder, MNT-30B, supersedes the Tube Department's MNT-30A and includes sixteen additional types. Complete and up-to-date technical data is provided.

For quick and easy reference, miniature tubes are listed numerically and

alphabetically, with short descriptions and metal and GT equivalents of each tube opposite the listings. Tubes are classified by type and function in a simplified chart on the first page.

Complete characteristics on each tube, together with operating conditions for typical use, are provided in a characteristics chart which is arranged for easy reference. Base diagrams furnish a quick guide to terminal connections.

The new MNT-30B Miniature Tube Folder is available free of charge from RCA Tube Distributors.

SOLDER BULLETIN

Points to consider in determining solder grade and size for a given job, melting points, and feet-per-pound of various sizes and grades, together with other information of value to solder users are described in a new solder bulletin just issued by Division Lead Company of Chicago.

Also included are four-color illustrations of the company's unique new "Solder Saver Snap-On Metal Covers" used on Divco one-pound solder spools. The metal spool cover snaps on and off easily. The cover protects the solder from dents and abrasions, keeps it bright and clean, and prevents uncoiling and waste.

Illustrations and descriptive material covering the company's acid core solder with non-liquid flux and the rosin core solder with the rosin dimer flux are also included.

A copy of the bulletin may be secured by writing Division Lead Company, Dept. 208, 836 W. Kinzie Street, Chicago 22, Illinois.

QUARTZ CRYSTALS

A new catalogue covering a complete line of quartz crystal units has just been released by Reeves-Hoffman Corporation of Carlisle, Pa.

The new bulletin, RHC-X, illustrates the variety of crystal holders available for special purpose calibration, mobile, aircraft, commercial, and marine radio use. Featured in this new publication is a small, universal crystal holder with a frequency coverage from 50 kc. to 100 mc.

For a copy of Bulletin RHC-X write to Reeves-Hoffman Corporation, 321 Cherry Street, Carlisle, Pa.

RADIART PROMOTION

The Radiart Corp. of Cleveland is currently using a new counter card to promote its line of Radiart Aerials for autos.

The card displays four of the company's line of aerials which feature

chrome plate finish and quality leads for noise-free performance. The aerials are weatherproof and will not short out from rain or snow.

Dealers wishing further details on these counter cards should write the company, *The Radiart Corp.*, Cleveland 2, Ohio.

SALES AID

The Electrical Division of *Olin Industries, Inc.* is offering two new point-of-sale aids for dealers handling the company's new *Winchester-Olin* interlocked flat cell radio batteries.

An appealing window streamer, in color, features an attractive girl in a bathing suit holding a portable radio, a sales message, and reproductions of the *Winchester "A"* and *"B"* batteries.

The second item is a lithographed card, in color, for a counter display. Space is provided for the insertion of a live battery.

Dealers interested in securing these sales aids should address their requests to Electrical Division, *Olin Industries, Inc.*, New Haven, Conn.

RCA SOUND CATALOGUE

The Engineering Products Department of *Radio Corporation of America* has just issued an 84-page illustrated catalogue listing the company's complete line of sound equipment.

The new booklet is divided into sections dealing with such sound products as microphones, amplifiers, speakers, program control and distribution facilities, and specialty products. Each section, in turn, presents a comprehensive list of products designed to meet needs ranging from those of portable systems to those of giant sound installations.

Concise descriptions of each model include such information as special features, uses, and specifications, as well as photographs and diagrams.

Copies of the new catalogue may be obtained on request by writing Sound Products Section, Engineering Products Department, *Radio Corporation of America*, Camden, N. J. Please specify the "Sound Products Catalogue #218-P."

AMPHENOL CATALOGUE

The new issue of *Amphenol's* catalogue A-1 covering AN connectors and fittings is now available to manufacturers and those engaged in procurement of these items for the Armed Services and industry.

Comprehensive in content, the catalogue contains a wide assortment of Army-Navy electrical connectors presented in a simplified manner. Each page gives specifications as to number of contacts, current or wire size, voltage or contact spacing. Illustrations show the assortment of insert arrangements available, and the number and size of contacts and mechanical spacing is tabulated.

AN fittings are presented with information required to make a selection and are indexed in numerical sequence for ready reference, dimensions, and functional diagrams. In-



THIS GRAVY TRAIN

Stops ONLY ONCE!!

Below Wholesale Cost!!!

WESTERN ELECTRIC

Better Buy 4



35 Watt Driver Unit
Orig. Govt. Cost \$40.00
8 ohm voice coil will handle up to 55 watts
\$595 ea.



10 for \$49.50

A sensational buy in quality reflex speakers. Blasting and blaring completely eliminated by a heavy gauge metal main trumpet section. The Western Electric Driver Unit, rated at 35 Watts will handle 55 watts safely without blasting. A new plastic diaphragm replaces the standard metal type and is unconditionally impervious to climatic changes and free from atmospheric corrosion. Min. power. Max. coverage. Reduces cost of installation. Full frequency response driver unit complete with projector. Excellent for concessions, ball parks, mobile. P.A. work.

\$1995 ea. 4 for \$75.00

MAKES AN EXCELLENT D. C. GENERATOR

GENERAL ELECTRIC AMPLIDYNES

MANUFACTURED FOR U. S. Air Forces

\$495

INPUT 27V DC OUTPUT 60 V 530 WATTS

Shaft app. 1" Dia. 1/2" Air cooled by removable fan. Unit measures 11 1/4" x 5 1/2" Brand New in Sealed Carbons.

TELEVISION SCOOP

Wave Trap & Booster

Clarifies picture, increases signal strength, helps eliminate ghosts and all external picture interference. Simply hook up in series with T. V. antenna. No power supply required. Housed in beautiful Black Crackle finish all steel case.

\$495 ea.

Size: 3 1/2" x 4 1/2" x 3 1/2" with large 3" Black Plastic Rotary Dial.

WIRE 15,000 Feet

#18 — 7 strand Black Plastic Vinylite, O. D. 1/4". This Wire has over 100 uses. Original Government Cost \$270.00. Just think—you can get this 15,000 ft. reel of wire at the unheard of price of

\$2495

All Prices F.O.B. N. Y. C.—20% deposit, Bal. C.O.D.

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RADIO ENGINEERING!

COMPLETE Radio Engineering Course. Bachelor of Science Degree. Courses also in Civil, Electrical, Mechanical, Chemical, Aeronautical Engineering, Business Administration, Accounting, Secretarial, Science. Graduates successful. 65th year. Enter Sept., Jan., March, June. Write for catalog.

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DEGREE IN 27 MONTHS

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POCKET TALKIE

As Low As \$9.95
REALLY WORKS—talk and hear 2-10 miles or more—FITS IN YOUR POCKET! Uses flashlight batteries. ABOUT SIZE OF 2 PACKS CIGARETTES! Wt. 1 LB.!

SEND ONLY \$1.00 (cash, check or M.O.) or pay postman \$1.52 C.O.D. for photo, picture blueprints, instruction book, parts price list with DETAILED CATALOGUE ON 135 OTHER PRODUCTS SUCH AS: 3-tube Pocket Radio, Cigar Box Transmitter, Dash Car Transmitter, Radio Garage Door Openers.
MOTOR INDUSTRIES CO., Dept. RW-11, Kearney, Neb.

PERFECT XMAS GIFT FOR KIDS YOUNG OR OLD 4 SPEED MOTORS



ONLY \$7.95

Calif. please add 20c for sales tax Plus \$1.00 for packing and shipping

Approx. 11" long
1/20th Horsepower 115 V 60 cycle AC motors with integral gear box having four 1/4" drive shafts turning simultaneously at the following speeds:
4000 RPM—Grinders, buffers, flexible shaft tools, etc.
1500 RPM—Wrapping fishing rods, slow speed tools.
25 RPM—Dev. tray rocker for photo darkroom.
5 RPM—Turning barbecue spits, Adv. Disp. Beams.
A Thousand Other Uses Around the Work Shop

MONEY BACK GUARANTEE

Pulleys, Mandrels, Belts, Etc., Available.

TROUP ENGINEERING CO.

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WINTER SPECIALS

EXCEPTIONAL VALUE

Sound Powered Head & Chest Phone Sets. Complete with cable and plug. Ideal for television installation. Slightly used, perfect condition. While They Last..... Pair \$12.50

SWITCHES

SPST AN-3022-2B Bat Handle, Lum. Tip	\$0.25
SPDT AN-3022-6B One side Mem. Center off, Lum. Tip	.25
DPDT Slide Sw. Stackpole 5 A 125V	.15
SPDT Momentary, center off, 6A 125V Long Bat Handle	.30
SPDT Center off, AN-3022-1B Lum. Tip, 6A 125V	.30
SPST Bat Handle, 6A 125V	.25
SPDT Bat Handle, 6A 125V	.30
DPDT Momentary, center off, 10A 125V	.50
DPST AN-3023-2, 10A 125V	.45
DPST Momentary, Push Type, 6A 125V	.35
SPST Rotary (enclosed) 6A 125V, 1/4" Shaft	.25
SPDT Phone Switch, 1/4" Shaft	.20
Micro Switch WZ-2RL2T1 normally closed each	.50

G. E. SWITCHETTES

CR-1070C103-B3 normally open	\$0.35
CR-1070C123-C3 normally open or norm. closed	.35
CR-1070C103-K2 normally closed	.35

SURPLUS SPECIALS

Small 110V AC 60 cycles open frame motor 1/2" shaft, 2700 RPM, 1/70 HP mfg. by Barber Colmann Co.	\$2.00
Synchronous Motors: 1/2" shaft 110V AC 60 cycle, 4/5, 1 1/2 & 1 3/4 RPM 2.2 Watts, mfg. by Hayden Mfg. Co.	2.00

(Specify speed desired)

WIRE WOUND RHEOSTATS

1.1 ohm 50 Watt with switch	\$1.25
6 ohm 25 Watt	.65
8 ohm 50 Watt	1.00
250 ohm 50 Watt	1.00
2500 ohm 25 Watt	.65

CONDENSERS & CAPACITORS

Standard Brands

Capacitor 500 mfd. 200 V DC	\$1.75
4 mfd. 2000 V DC Oil Filled Cond.	3.75
10 mfd. 1500 V DC Oil Filled Cond.	2.95
1 mfd. 2500 V DC Oil Filled Cond.	1.25

MISCELLANEOUS

PL-259A Coax Connector & Socket silver plated, for RG8U & RG11U. Pair	\$0.60
Variable ceramics 4-30 mmf 7-45 mmf.	.25
Telescoping Antenna 7 foot	1.00
Rectifier, Copper oxide, full wave 110V AC input, 100 V DC output 1A	3.50
Solenoid, 6 V DC complete with plunger and mtg. bracket	1.25
Pilot Light Assy. complete with 1/2" jewel, white or red, & 6V bayonet socket	.25
Flexible Shaft 8 1/4" long with spline ends	.25
PL-55 Phone plug with 4' cord	.30
DI-Heptal sockets (less mtg. ring)	.50
2X2 socket	.35
Octal Stellite socket	.15
4 Prong socket	.12
Shock Mounts (Lord) cap. 75 lbs.	.60
Stepdown Transformer UTC Type 63823 220V to 110V, 100 Watts, 60 cycles	4.00
Octal plug	.20
T-17 Microphone with press to talk switch, cord & plug	.79
Phantom Antenna, Model A 27	1.25
Foot Switches, 110V	Each 1.00
Goggles (Resistal Non-Shatterable) Pair	1.00
Circuit Breakers, 110V 5 Amps, Mfg. by Heineman	Each 1.00
Meter Multiplier, 4 megohms, 14 watts Mfg. by Sprague	Each 1.50

Variable Condensers, Ceramic Insulation	
C115-10-45 mmf with coil, tunes to 31 mcs.	.50
C122-7-27 mmf with coil, tunes to 58 mcs.	.50
C106-11-115 mmf	.35
IS-330 mmf 1/4" shaft, brass plates, Ceramic	.75
Dual 260 mmf per section, 1/4" shaft, Mg Calox	.75

No sale less than \$2.00. All prices F.O.B. N.Y.C. Add 25c to cover postage. 20% deposit required with all orders.

A. M. RADIO SALES CO.

345 Canal St. New York City 13, N. Y.

serts are numerically listed by the Army-Navy numbers and cross-checked by page reference as to available types of shells and constructions.

Requests for catalogue A-1 must be made on your business letterhead. Write direct to *American Phenolic Corporation*, 1830 South 54th Avenue, Chicago 50, Illinois.

MASCO SOUND SYSTEMS

Mark Simpson Manufacturing Company, Inc. of Long Island City, New York has just released its catalogue No. 48 covering the company's complete line of sound equipment.

Included in the 24-page catalogue are amplifiers, portable sound systems, microphone mixers, remote-control amplifiers, mobile equipment, disc recorders, transcription players, musical instrument amplifiers, speaker cabinets, microphones, speakers, magnetic horn units, and accessories.

Complete specifications, application data, and descriptive material is provided for each item covered. A price list is included with the catalogue.

For a copy of catalogue No. 48 write to *Mark Simpson Manufacturing Company, Inc.*, 32-38 Forty-ninth Street, Long Island City 3, New York.

ALLIED'S 1949 CATALOGUE

Allied Radio Corporation of Chicago has just released its 1949 catalogue, a 180-page buying guide to "Everything in Radio and Electronics."

Designated catalogue No. 117, the new publication contains complete listings of radio and electronic parts, test equipment, batteries, p.a. systems, ra-

dios, radio-phonographs, television sets and components, recording equipment and accessories, changers and playback equipment, phono motors, amateur equipment, radio builders' kits and supplies, tools, books, diagrams, and a wide variety of other items in the electronics field.

The new 1949 catalogue is available free on request from *Allied Radio Corporation*, 833 West Jackson Boulevard, Chicago 7, Illinois.

BUSINESS AIDS KIT

Sixteen of the *RCA Tube Department's* most valuable "aids to better servicing" have been combined into a single "Business Aids Kit" now being made available to radio dealers and servicemen through *RCA, RCA Victor*, and *Cunningham tube distributors*.

An 8-page cartoon brochure describes how the service aids package is designed to help servicemen speed up repair work, cut corners, and eliminate some of the "bugs" that bottleneck shop operation.

The brochure lists each of the most common service shop "bugs" and shows how one of the service aids can be used to handle the problem. Included are the company's new "Triple Pindex," the resistor code automatic pencil, the *RCA Receiving Tube Manual*, the companion quick reference booklet on receiving tubes, the *Tube Movement and Inventory Guide*, the *RCA "Radio Service" decal*, etc.

Interested dealers and servicemen should see their *RCA tube distributor* for full information on the "Business Aids Kit."

The Twenty-Fifth Board of Directors of the Radio Manufacturers Association are from left to right (top row) Ray H. Manson, Ernest Searing, E. A. Nicholas, J. J. Kahn, Vice-President R. E. Carlson, Vice-President W. J. Barkley, Vice-President G. M. Gardner, Frank M. Folsom, R. C. Sprague, Larry F. Hardy, and Benjamin Abrams. Second row (left to right) H. C. Bonfig, W. A. MacDonald, Joseph Gerl, Walter Evans, W. R. G. Baker, President Max F. Balcom, Treasurer Leslie F. Muter, Paul V. Galvin, E. Alschuler, F. R. Lack, and G. W. Thompson. The third row includes: H. C. Matthes, Thomas A. White, Ray F. Sparrow, J. H. Stackpole, Vice-President Allen Shoup, Vice-President A. D. Plamondon, Jr., W. P. Hilliard, Allen B. DuMont, G. Richard Fryling, and H. L. Hoffman. The bottom row (from left to right): H. J. Hoffman, Herbert W. Clough, S. In-sull, Jr., A. Blumenkrantz, John W. Craig, Executive Vice-President and General Manager Bond Geddes, Gen. Counsel John W. Van Allen, George Lewis, Lloyd H. Coffin, D. Wald, Geo. R. Haase, and H. G. Sparks. This board will serve for term of 1948-49.

TWENTY-FIFTH BOARD of DIRECTORS R.M.A. 1948-49



What's New in Radio

(Continued from page 84)

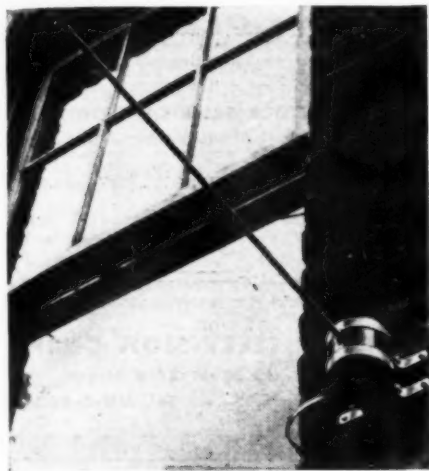
stub until the point of best signal is reached.

A data sheet and chart of antenna lengths for different bands is available. Write to *Marino Radio Co.*, 203 Greenwich Street, New York 7, New York.

VERTROD ANTENNA

Vertrod Corporation of New York is currently marketing a new series of rod-type, all-channel TV-FM-AM antennas which represent a departure from the dipole theory.

The new unit mounts on the outside of a window where it projects no more



than 45 inches and selects a stronger signal. The unipole, according to the company, has proven effective in cases where rooftop installations are impractical or not allowed, such as in multiple dwellings, private homes, etc.

Each of the rod antennas has a patented adjustable base allowing 180 degree rotation in the horizontal or vertical plane. The rod-type antenna makes a simple, low-cost installation, and is circuited for 300 or 72 ohm transmission lines. Two models (TV-FM and TV-FM-AM) feature weather-resistant aluminum alloy parts. The models differ in the network contained within the hermetically sealed housing.

Descriptive literature and further information is available from *Vertrod Corporation*, 11 Park Place, New York, New York.

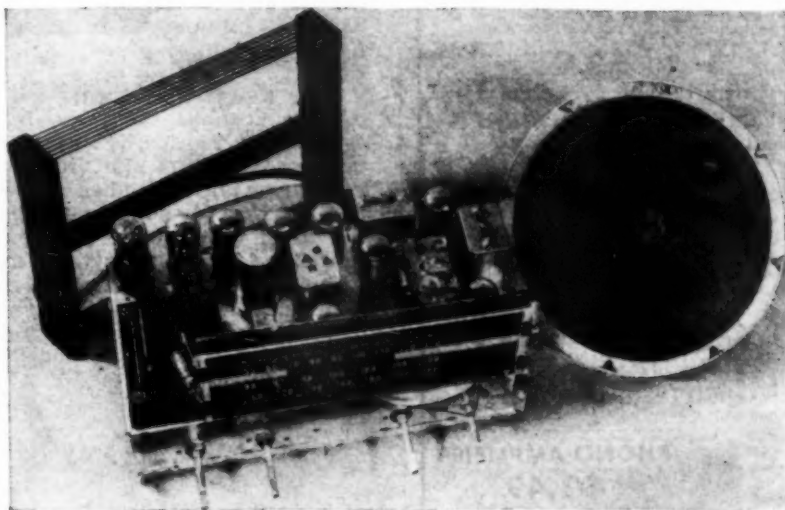
CHASSIS PUNCH

The *Pioneer Broach Company* of Los Angeles is marketing a new chassis punch which cuts square holes in sheet metal and simplifies the job of attaching otherwise "hard to mount" parts by allowing this work to be done in a rapid and easy manner.

The new punch method is not limited to square holes. In addition, angular, rectangular, L-shaped, or any square corner pattern type hole can be cut with precision and ease. It is merely a matter of making combination cuts, if necessary, to achieve the desired pattern.

November, 1948

We're GILDING the LILY!



the NEW, IMPROVED Model 7-B-1,
engineered to meet YOUR needs!

Carefully engineered, and manufactured of the finest materials, the ESPEY Model 7-B-1 is specifically designed to meet the most exacting requirements for a replacement chassis, and will lend itself to any type of installation. This model is drift-compensated, AM/FM, with 10 tubes plus rectifier. Supplied complete, ready to operate.

Send to DEPT. A-11 TODAY for FREE LITERATURE

ESPEY MANUFACTURING COMPANY, INC.

528 EAST 72ND STREET-NEW YORK 21, N. Y.

"ESTABLISHED—1928"

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Indiana
IT'S

Stanton Radio Supply
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RADIO ENGINEERING 27 MONTHS
DEGREE IN

Intensive, specialized course, including strong basis in mathematics and electrical engineering, advanced Radio Theory and Design. Modern laboratory. Low tuition. Self-help opportunities. Also 27-month courses in Aeronautical, Chemical, Civil, Electrical and Mechanical Engineering. Gov't approved for G.I.'s. Enter Dec., March, June, Sept. Catalogue. **INDIANA TECHNICAL COLLEGE**
9118 E. Washington Blvd., Fort Wayne 2, Indiana

FOR BEST UHF PERFORMANCE
TROUGH-LINE FRONT ENDS
Television—F.M.—Amateur 2-meter

- Model 1
40-220 MC
- Model 2
80-120 MC
- Model 3
140-150 MC
- High gain, low
noise factor
- A quality product



Wired and tested.....\$18.95
High gain I.F. Amp. 10.7 MC.....\$50.00
Complete building instructions for I.F.
amplifier.....\$3.00

WARDELL SMITH
65 Glenwood Rd. Upper Montclair, N. J.

"America's Best Buy"

12-24 VOLT TRANSFORMER

Just the transformer for the filaments of ARC transmitters and receivers or other surplus equipment. Strap mounting. 110 Volt 60 Cycle Primary. Secondary has two 12½ Volt 2½ Amp. windings. Can be paralleled to give 12½ Volts at 5 Amps., or series to produce 24 Volts at 2½ Amps.

SPECIAL \$2.95



CRYSTAL PHONOGRAPH CARTRIDGE

L72-A High output crystal cartridge. The best for all around replacement use. While they last.

\$1.49 Each.

10 for \$13.00

SUPER-BUY

100 ¼-WATT RESISTORS 39¢

No kidding. 100 assorted ¼-watt carbon resistors from 10 ohm to 10 Megohm for only 39¢. These resistors are NOT color coded, so use your ohmmeter and save plenty.



PHONO AMPLIFIER

\$2.49

With Tube

1 tube, AC-DC phono amp. with 117L7 tube. Good tone and volume for small phonographs. Only \$2.49

PHONO. OSCILLATOR with tube. Similar to the phono amp but an oscillator with a tuning range from 550 to 800 KC. Priced with 117L7 tube at only \$3.95. Not kits but assembled and tested units.

78 RPM standard Phono Motor \$2.79

Crystal Phonograph pick-up arm 1.95

SPECIALS

50L6 Output Transformers 10 for \$3.90
AC-DC Chokes, 300 Ohms 10 for 3.90
40 MA. 6.3 V. Power transformer 1.89
25 Assorted Knurl type Knobs .93
Antenna Loops, Assorted sizes 4 for .98

TUBULAR ELECTROLYTICS

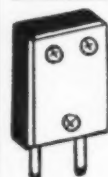
Fresh Stock. Fully Guaranteed

Capacity	W.V.	Each	per 10	100
25 mfd.	25V	\$0.17	\$1.59	\$14.95
50 mfd.	50V	.21	1.79	16.95
100 mfd.	50V	.24	2.29	19.98
20 mfd.	150V	.21	1.89	17.95
30 mfd.	150V	.22	1.95	18.95
40 mfd.	150V	.23	2.04	19.74
50 mfd.	150V	.24	2.14	20.45
20-20 mfd.	150V	.29	2.49	22.98
30-20 mfd.	150V	.32	2.95	25.98
40-20 mfd.	150V	.36	3.25	29.95
50-30 mfd.	150V	.39	3.49	32.98
8 mfd.	450V	.21	1.99	19.50
8-8 mfd.	450V	.42	3.98	35.76
16 mfd.	450V	.39	3.74	33.78

BY-PASS CONDENSERS

		\$0.06	\$0.55	\$ 4.50
.01	600V	.06	.55	4.75
.02	600V	.06	.55	4.95
.05	600V	.07	.65	5.43
.1	600V	.11	.98	8.95
.25	600V	.14	1.25	9.95
.005	1700V	.14	1.25	9.95
.007	1700V	.15	1.30	10.20
.01	1700V	.15	1.30	10.20
.02	1700V	.16	1.40	10.95

An assortment of 50 of the above By-pass condensers. Fine value for the small shop or experimenter, only \$2.98



CRYSTALS 98¢ each

Your frequency plus or minus 10 KC

80 Meter, 3500-4000KC
40 Meter, 7000-7300KC
for multiplying into
20 Meter, 7300-7425KC
10 Meter, 7300-7425KC
2½ Meter, 8000-8222KC

Postage extra 20% deposit on COD.
Write for latest bargain list featuring
"America's Best Buys."

POTTER RADIO CO.

1314 McGee St., Kansas City 6, Mo

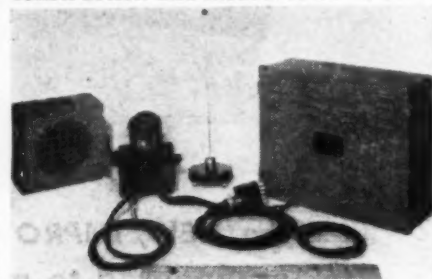
This chassis punch was designed specifically for the radio and electronics field although it may be used equally well in mechanical fields. At present the punch is made in two square sizes, ⅝" and ¾".

Complete descriptive material is available on request to *Pioneer Broach Company*, 1424 South Main Street, Los Angeles 15, California.

NEW MOBILE UNIT

Communications Company, Inc. of Coral Gables, Florida, is currently introducing the Model 275-C mobile radiotelephone unit which has been especially designed for police, taxicab, fire department, railroad, and other mobile applications in emergency service operating in the 152-162 mc. FM band and other FM services operating above 30 mc.

The Model 275-C is of single unit construction and measures 13" x 11" x



5". It is completely self-contained with the transmitter, receiver, and power supply in one compact unit. The unit may be mounted either flat or vertically and weighs only 20 pounds.

For automobile installation it is mounted on the firewall like a broadcast receiver thus conserving trunk space. A small control box with microphone hangup mounts on or under the dash. The set uses new, low-cost receiving tubes throughout and uses three low-priced transmitting tubes. Transmitter power output is 8 to 10 watts. The set employs a single heavy-duty vibrator power supply using only one long-life non-synchronous vibrator supplying two high voltage outputs. Only 13 amperes total drain from the car battery is required to produce the 8 to 10 watts output.

For complete data on the Model 275-C address your inquiries to *Communications Company, Inc.*, 300 Greco Avenue, Coral Gables, Florida.

NEW SCREWDRIVER

Of interest to radio servicemen is the new *Vaco Products Company's* duplex reversible screwdriver which accommodates both the Phillips and regular type screws by merely reversing the blade.

A positive spring action clutch in the center of the shaft provides foolproof chucking which allows no wobble yet permits easy and fast reversing operation. The "Amberly" handle is Slo-Burning for safety, has fluted edges chamfered for comfort, with deep flute vacuum grip, and bears the Underwriters' Laboratories reexamination service marker. It is shock and

LIFE-SIZE TELEVISION is here!

Now, here's really great news in television! The amazing CORTLEY PROJECTION TELEVISION RECEIVER—a set capable of throwing an image, varying in size from several inches up to 6 x 8 feet, onto a screen.

This compact, highly mobile CORTLEY RECEIVER enables hundreds to view a telecast without straining at images previously measured in inches. And, its operation is as simple as a home movie projector—with only 4 operating controls furnished.



CORTLEY MODEL No. 720

THESE ARE YOUR SALES OPPORTUNITIES

Every Bar, Club, Restaurant, Hotel, Resort, School, etc.—has been clamoring for television that can be seen by large groups of people at one sitting. And now you can supply them with LIFE-SIZE television at an amazingly low price.

The market is wide open. Be the first to take advantage of the enormous need. Send for full information and price right now!

A limited number of Cortley Distributorships are still available. Write—wire—phone for particulars today.

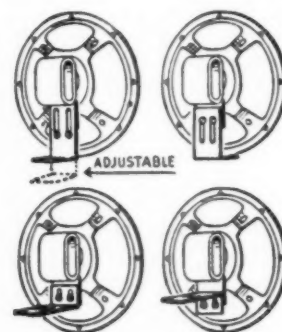
CORTLEY TELEVISION CORP.

Dept. A, 15 West 27th Street
New York 1, N. Y. Tel. MU 3-3624

YOU DON'T HAVE TO GRUNT & SWEAR & SWEAT

when installing Wright Verified Speakers
with the new
Adjustable Mounting Bracket

They fit on like an old shoe



Write for literature and name of nearest distributor

WRIGHT Inc.

2232 University Ave., St. Paul 4, Minn.

break resistant and is impervious to most alkalies and acids.

The new tool is available in two sizes, one with a No. 1 Phillips point and $\frac{3}{16}$ " regular point, and the other



with a No. 2 Phillips point and a $\frac{1}{4}$ " regular point.

For further information on the new reversible blade screwdriver write to Vaco Products Company, 317 East Ontario Street, Chicago 11, Illinois.

HIGH "Q" CHOKES

Chicago Transformer, Division of Essex Wire Corporation, is currently marketing two new compact high "Q" chokes.

Although designed specifically for use in dynamic noise suppressor circuits, the NSI-1 and NSI-2 reactors can be used in any tuned circuits requiring the given inductance.

Inductance values, 2.4 and .8 henrys respectively, are accurate within plus or minus 5% with up to 15 ma. of direct current. Units have a minimum "Q" of 20.

The two chokes are mounted in identical drawn steel cases and are very



compact, measuring only $1\frac{1}{16}$ " by $2\frac{3}{8}$ " by $1\frac{1}{16}$ " over-all.

For complete data on the new high "Q" chokes, write direct to Chicago Transformer, 3501 W. Addison Boulevard, Chicago, Illinois.

NEW TV ANTENNA

A new television antenna which the manufacturer claims will increase the range of television and FM sets in fringe areas by as much as 15 to 25 miles has been developed by Eastern Transformer Company, Inc. of New York.

The "Double U" antenna uses three reflector elements, two director elements and two collector elements. The new unit features ease of assembly and installation; mechanical stability of design and operation; correction of ghost images; comparatively low cost; and elimination of unwanted sound and picture disturbances caused by

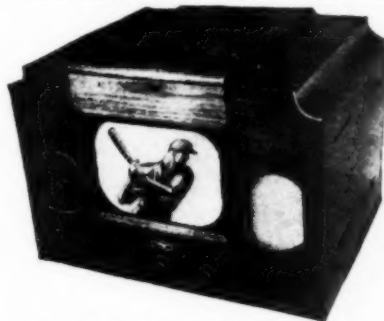
November, 1948

NEW YORK HEADQUARTERS FOR TRANSVISION

Biggest Values in TELEVISION
Easiest to Assemble—Lowest in Cost

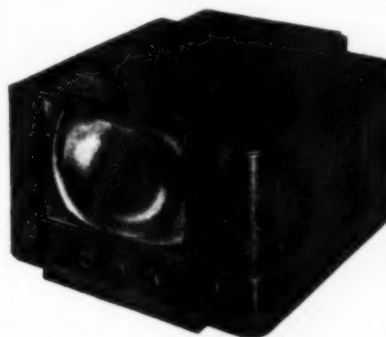
All prices are for complete kits with all parts, tubes, antenna, 60 foot lead-in wire.

Model No.	Description	Net Price
7	7" TV kit with wood front panel—5 channels.....	\$149.50
7BL	7" TV kit with table cabinet and built-in lens for 60 sq. in picture—5 channels... with cab.	189.00
7FL	Same as 7PL, but with 13 channel TV/FM tuner—75 sq. in. picture.....	198.00
10FL	150 sq. in. picture TV/FM kit, complete with new all-angle lens built into a lucite frame—13 channels.....	249.00



TV/FM kit with 13 channel tuner, 12" Standard.....	246.00
TV/FM kit with de luxe 13 channel tuner, 12" De Luxe.....	293.00
As Illustrated	

Model No.	Description	Net Price
7CL	Same kit as 7BL—cabinet is console, 2-piece swing-top.....	\$199.00 with cab.
7PL	Same kit as 7BL—NEW ALL ANGLE LENS is built into lucite front panel—75 sq. in. picture.....	179.00
10BL	120 sq. in. picture—10" electro-magnetic TV kit with FM radio-lon Trap—prolongs life of tube—Table model walnut or blond, cabinet has built-in 15" lens—13 channels.....	299.00 with cab.



TERMS—10% net with order, balance C.O.D., or remit in full to save C.O.D. charges.

DEALERS

Write in on your stationery for best dealer net prices.

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Store
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New York

Phone
TRafalgar 7-4487
Write Dept. RN11

Store & Warehouse
1919 Broadway
(at 64th)
New York 23
New York

TRAIN IN FLORIDA TO BE TELEVISION TECHNICIAN

Plenty of jobs—G.I. approved

The Institute of Radio & Television
Jacksonville, Florida

PEN-OSCIL-LITE

Extremely convenient test oscillator for all radio servicing; alignment • Small as a pen • Self powered • Range from 700 cycles audio to over 600 megacycles u.h.f. • Output from zero to 125 v. • Low in cost • Used by Signal Corps • Write for information.

GENERAL TEST EQUIPMENT
38 Argyle Buffalo 9, N. Y.

STEADY PROFITS



Your Own
Business with
CORADIO
The Coin Operated
Radio

Place these specially built radios that play 1 or 2 hours for 25c in the thousands of available hotel rooms, tourists courts, etc. They yield immediate profits and steady income. Install Coradio, the finest made. Limited capital required. Send for further information. Write today.

CORADIO Coin Operated Radio
Dept. "J"

212 Broadway, Phone: BEekman 3-0038-9
NEW YORK 7, N. Y.

SCOTT

Famous Marine Receivers, built like battleships to last a lifetime. Each is thoroughly rebuilt & carries the standard RMA guarantee. Rack case measures 20" wide, 19" deep, & 13 1/2" high. Audio output to match 500/600, 300, 200, 150, & 120 ohms. All sets shipped complete with tubes. Priced at a fraction of their original Gov't cost these sets will make ideal Christmas gifts. Quantity is limited. All sets operate at 117 V. 50/60 Cyc. A. C. only.

SLR 12 A . . . 12 Tubes, variable bandwidth, sensitivity control, gain control, phone jack, Noise limiter, Tone control, Phono input, Slide rule dial, Magic Eye. Extremely sensitive. Uses two 6SK7, two 6J5, two 5Y3, 6SA7, 6SJ7, 6K7, 6V6, 6E5, 6H6. Continuously covers 540 Kc. to 15 Mc. on Three bands **\$99.75**

SLR 12 B . . . Similar to above, except that a High Fidelity Push-Pull amplifier is incorporated into this model, making it a wonderful buy for music lovers. Uses two 6V6, two 6SK7, two 6J5, 6SA7, 6K7, 6H6, 6SN7, 6E5, and 5U4. **\$114.50**

CZC . . . Frequency Range: 80 to 560 Kc., 1.9 to 24.0 Mc. on Five bands. Uses 6K7, 6SA7, 6SJ7, two 6H6, two 6SK7, 6V6, 5U4. The real McCoy in communications receivers. Large Rotary dial, BFO, Variable bandwidth, Phone jack, Dial Lock, Ant. Trimmer, etc. Absolutely tops in construction, operation and sensitivity. **\$109.95**

CW3

WILCOX 7 tube AC receiver. Originally designed for fixed frequency operation, but with our conversion instructions it will make a Dandy 4 band communications set. Uses two 6K7, two 6C8, 6K4, 6SN7, 80. Comes in original crate, complete with two sets of tubes, manuals and instructions. **\$16.95**

HOWARD AC RADIO CHASSIS

Complete with Phono input, Tone control, 6x9 PM Speaker, Tubes, Knobs, Escutcheon Plates, Hardware and loop antenna.
Nine Tube FM and AM. **\$49.95**
Six Tube AM. **\$22.95**

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Discontinued cabinet from a Famous Manufacturer's Table combination. Plenty of room for an automatic changer, and one of the chassis listed below. Priced for quick clearance, these beautifully finished cabinets should not be overlooked. Width 22 1/4". Depth 16 1/4". Height 11 1/4". **\$4.95**

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FARNSWORTH HEAVY DUTY. Efficient, quiet, foolproof. Will provide countless hours of trouble-free entertainment. **\$17.95**

FIVE TUBE FAMOUS MAKE RADIO CHASSIS

U.L. APPROVED. NATIONALLY ADVERTISED
Original Plastic cabinet for above **\$13.85**
above **1.10**

THREE TUBE AC-DC AMPLIFIER

Well made, has tone and Volume control. Uses 50L6, 12SQ7, 35Z5. Less Tubes **\$2.75**
Tube Kit for above. **1.75**

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WITH 6V6 OUTPUT TRANSFORMERS.
5 Inch—1000 Ohm Field. **\$1.95**
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6 Inch—1400 Ohm Field. **2.45**
6 Inch—Heavy Slug P.M. **2.45**

TUBULAR ELECTROLYTIC CAPACITORS

Hermetically sealed can in Cardboard tube.
C-D 16 Mfd. @ 150V. **27c each**
10 for **\$2.40**
20, 20 Mfd. @ 150V. **41c each**
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VOLUME CONTROLS

1/2 Inch shaft your choice .5 or 1 Meg.
17c each. 10 for **\$1.50**
SELENIUM RECTIFIERS

100 Ma. **49c each**
CARBON RESISTORS. Asstd. values and Wattages. 100 for **\$1.50**
455 Kc. IF Transformers. **39c each**
455 Kc. Osc. Coils. **19c each**
Perm. NEEDLES—1000 play. **25c each**

HIGH FREQUENCY TELEVISION ANTENNA

Folded dipole, with reflector, with universal mounting clamp. Light weight but solid enough to weather the fiercest storms and ice formations. List **\$9.45**, each **\$4.65**, three for **\$12.75**.

Further details on these and other specials can be obtained by writing for bulletin R3. Minimum order \$5.00. Minimum C.O.D. order \$10.00. A 20% deposit is required on all C.O.D. orders.

ETUDE ELECTRONIC LABORATORIES

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Telephone JErôme 7-0601

automobiles, x-ray, and diathermy equipment, according to the manufacturer.

The elements are packed ready for assembly on a galvanized steel 10 foot pole which, in most cases, gives sufficient height when used in any chimney or other mounting base. All connecting screws and hardware are heavy chromium plated to withstand corrosion. It is said that two men can assemble the new antenna in 30 to 45 minutes with only a screwdriver and a socket wrench.

For further information write *Eastern Transformer Company, Inc.*, 147 West 22nd Street, New York 11, New York.

SHURE MICROGROOVE PICKUP

The new 900MG crystal phonograph pickup for Microgroove records is currently being marketed by *Shure Brothers, Inc.* of Chicago.

The pickup tracks at 7 grams and has a needle force of 9 grams as an added safety factor. The unit uses a



special offset osmium-tipped needle with a point radius of only .001" and has an output of 1 volt.

The *Shure* lever system has been adapted in the development of this new pickup thus providing high needle compliance.

For further information on the 900-MG pickup write direct to *Shure Brothers, Inc.*, 255 West Huron Street, Chicago 10, Illinois.

TV ANTENNA ADAPTER

A high frequency television antenna adapter for those wishing to tune in Channels 7 to 13 has been announced by *Technical Appliance Corp.* of Sherburne, New York.

The new unit, consisting of a half-wave folded dipole with reflector as well as a quarter-wave connecting link with the existing antenna, has a matching network so designed that instead of the usual loss that occurs when loading one antenna with another, a gain is achieved over the low band.

The Type 445 high frequency antenna adapter is supplied with an aluminum tubular mast extension which

PLAY MICROGROOVE AND STANDARD RECORDS WITH THIS DUAL SPEED PHONOGRAPH

SPECIAL
\$39.90
Incl. Fed. Tax
RCA
Licensed



Has Dual Speed Motor and Dual Crystal Pickups. Powerful Hi-Fi 3 Tube Amplifier with Volume and Bass Controls. Heavy PM Speaker. 2 Tone Leatherette Carrying Case. We absolutely guarantee this unit to meet with your satisfaction, or your money back in 10 days. **MODEL JH-3: 117 Volts A.C.**

MODEL DA-2: Same case as above. Plays new microgroove records only. Attaches to your Phonograph, Radio or Console. 117 Volts A.C. **\$19.90**
SPECIAL

\$10 with order, rest C.O.D.

DEALERS: WRITE FOR NET PRICES
SARVI ELECT. MFG. CO.
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Amazing RADIO SCOOP!

smart all-metal crackle finish case sparkling chrome trim

plays 2 hours for 25c; can be adjusted to play without coin insertion if desired



Powerful Golden-Voiced

TABLE MODEL

Made for hotels, tourist camps, institution use—ORIGINALLY SOLD FOR \$100.00.

- 6 tube superheterodyne
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- Made by world's largest radio manufacturer (name is on each set)
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\$29.95 ea.

A terrific scoop . . . we pass the savings on to you. These excellent radios originally sold for \$100.00. We bought the entire overstock at a fraction of production cost. **MAIL ORDERS FILLED IMMEDIATELY**, while stock lasts. Send 25% with order.

BRADLEY ASSOCIATES, INC., Dept. RN
1652 N. Damen Ave., Chicago 47, Illinois

RADIO & TELEVISION NEWS

mounts to the mast of the existing low frequency antenna assembly by means of a coupling clamp.

The adapter may be oriented independently of the low frequency antenna thus providing satisfactory reception by minimizing ghost troubles.

For further information on the *Taco* Type 445 high frequency antenna adapter write to *Technical Appliance Corp.*, Sherburne, New York.

SOLDERING ELECTRODE

The *Cal-Perry Corporation* of East Orange, New Jersey, is currently marketing a new and improved soldering iron tip for use with electric soldering guns.

The new tip, which has been successfully field tested in the radio and television fields, features a chromium plated copper electrode with only the surface of the tip exposed to prevent heat loss. Heating time is only 9 seconds. The heat generated is sufficient to cover average soldering needs and often eliminates the need for heavier irons.

For further details on the new tip write to *Cal-Perry Corporation*, 62 Franklin Street, East Orange, New Jersey.

-30-

International Short-Wave

(Continued from page 130)

land, FOVA, Radiosektionen, Germany, via Denmark. (Engdahl, Sweden) However, a more recent report on a Swedish DX Program said this station had "left the air for good."

Greece—Radio Athens, 15.345, is an excellent signal in daily beam to the United States beginning 1730, news at start. (Ormond, N. C., Glenn, Pa.) Is using 9.605 to relay Home Service in its "morning" transmission, replacing 6.175; on at 0000 with Greek recordings; 0015 Greek National Anthem followed by news in Greek; 0030-0100 music. On Sundays only relays religious program at 0100-0130 then fades out in North Africa; may not be complete schedule. (Bluman, North Africa, via Radio Australia)

Pearce, England, reports he hears the Democratic Greek Radio on approximately 6.835; has news in French 1400; closes down 1410; frequently says "Vive la Republique et vive Gen. Markos."

Haiti—A new outlet in Port-au-Prince, reported by Kary, Pa., is on 6.406, heard to 2030 sign-off; programs appear mostly recorded symphonic music; poor modulation.

HH2S, 5.94, Port-au-Prince, is heard 1830-2035; at least some days has English talk 2030-2035. (McPheeters, La.)

Hawaii—Latest schedule of KRHO, Honolulu, relaying programs from continental U. S. is—15.250, 0400-1005, to China-Philippines; 17.800, 0230-0345 (not Mondays to China-Philippines with UN broadcasts.

Honduras—Kary, Pa., reports HRA,

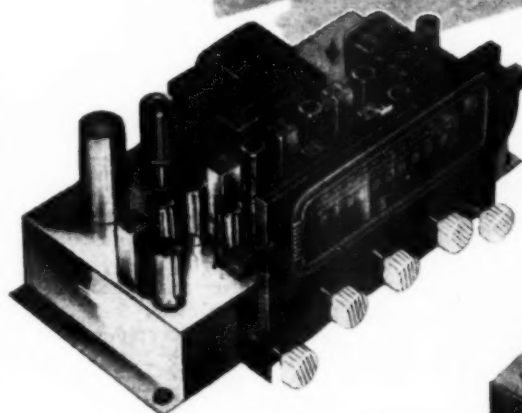
THREE 3'S ON YOUR RULER?



Accurate measurement with a ruler with "triplet" inch marks is no more annoying than tuning an FM receiver which brings in a station at three points on the dial.

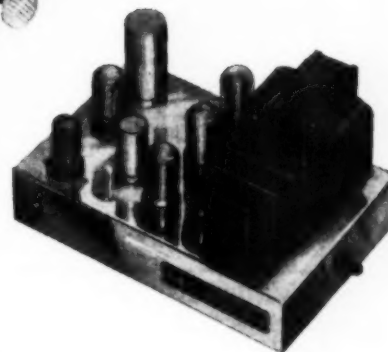
Eliminate multiple tuning responses and annoying drift by owning a *Craftsmen Aut-O-Lok* tuner. *Aut-O-Lok* tunes easily and quickly with one and only one dial setting for a station—and automatically locks the station against drifting.

AUT-O-LOK TUNER



HI-FI AMPLIFIER

FM-AM TUNER RC-8. Features automatic frequency control, most revolutionary development in FM design—entirely eliminates drift and multiple tuning responses. Nine shielded miniature tubes plus rectifier include double limiter and tuned RF stage in both FM and AM. Low-impedance loop, enabling flexibility in mounting, provides low-noise AM reception. Rear socket provides easy access to 6.3-volt AC and exceptionally well-filtered DC for supplying external pre-amplifiers, additional pilot lights, etc. Controls include separate bass, treble and switch positions for phonograph and television audio inputs. Polished chrome chassis. Audio cable, escutcheon, decals, antennae, and detailed installation instructions furnished.



HI-FIDELITY AMPLIFIER RC-2. High-impedance input; 12 watts output at 1% distortion. Taps: 4, 6, 8, 15, 500 ohms. 65 db gain, including inverse feedback. Uniform frequency response from 20 to 20,000 cycles up to 8 watts output. Hum 65 db below rated output. Tubes: 6J5, 6SN7, (2) 6V6, 5Y3. Durable polished chrome chassis.

Sold by the Better Distributors.

Write for Circular "A".

The RADIO CRAFTSMEN, Inc.

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WANTED

Western Electric Vacuum Tubes, types 101F, 102F, 272A, 274A or B, 310A or B, 311A, 313C, 323A, 328A, 329A, 348A, 349A, 352A, 373A, 374A, 393A, 394A, 121A Ballast Lamps. Box 470, **RADIO & TELEVISION NEWS**, 185 N. Wabash Ave., Chicago 1, Illinois.

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Brand New Surplus! Guaranteed! For rotating ham, FM, Television antennas and many other uses.

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- Reversible, No Free Swing, Quiet
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TELEKIT
\$59.50**

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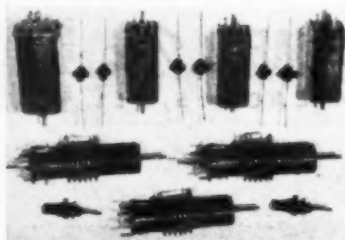
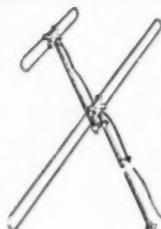
Completely redesigned 7-A Telekit features an R. F. 6000 Volt high voltage supply to assure brilliant pictures. Factory built and aligned 13 channel tuner. Miniature high frequency tubes used throughout R. F. and I. F. circuits. 7JP4, 10HP4 or 10JP4 cathode ray tubes can be used without circuit change. Completely new redesigned sweep circuits. Comes complete with instructions, less tubes and cabinet. 7-A cabinet \$21.00. 7-A tube kit with picture tube \$39.58.

New 10-A Telekit has electro-magnetic scanning and focusing, A.F.C. horizontal hold control, factory built 13 channel tuner, 10,000 volt Fly-Back high voltage supply. Comes complete, less tubes and cabinet. 10-A cabinet \$23.50. 10-A tube kit with picture tube \$57.30.

Famous Telekit easy-to-follow illustrated instruction books come with each kit. Tested and proven at Television Training Institute by more than 5,000 students, and successfully followed by more than 18,000 Telekit builders.

ALL WAVE ANTENNA \$7.95 COMPLETE

NEW TELEKIT ALL WAVE ANTENNA has both high and low frequency folded dipoles which can be positioned independently. Rugged all-aluminum construction and high frequency all weather insulators. It's quickly and easily assembled. Comes complete with all hardware in place and 60 feet of 300 ohm transmission line.



No. 20 I. F. TELEVISION COIL KIT is perfect for a custom receiver. Fifteen coils include: 4 video I. F. coils, 2 sound I. F. transformers, converter transformer, cathode trap, discriminator transformer and 6 peaking coils. This kit can be used in 7, 10, 12, 20 inch or projection receivers. \$14.50 complete.

TELEKIT
ELECTRO-TECHNICAL INDUSTRIES
1432 NORTH BROAD STREET PHILADELPHIA 7, PA.

Tegucigalpa, on a new frequency of 6.049, announcing "Transmita HRA, La Voz de Lempira en Tegucigalpa, capital de la Republica de Honduras." News in Spanish of Central and South America 2055-2100, usually preceded by bugle call; with identification announcement, normally three chimes are sounded. Signals are only fair with considerable static and rather severe teletype and CWQRM.

India—Radio Australia reports the new Decan Radio, Hyderabad, on 730 kc. and 3.335 at 2200-2330, 2330-0330, and 0630-1300; and on 6.170 at 0730-1230.

Iran—Radio Teheran now closes on 6.155 at 1300; re-opens to Europe on 15.100 at 1330, runs to 1430; news 1410. (Bluman, North Africa, via Radio Australia) However, some days the 15.100 runs as late as 1500, usually last half hour being Western dance music. (Pearce, England) I have heard it that late recently here in West Virginia. The 15.100 channel also carries news 0615 now.

Israel—In verifying by letter for Kary, Pa., Kol-Israel, Tel Aviv, Broadcasting Station of the State of Israel, stated the transmitter is not of only a few hundred watters power, but a medium-size station (they did not list actual power); antenna is a dipole which has a general direction towards the United States; transmissions scheduled 2145-2230 (this one is heard fairly well in Eastern U. S.), 0000-0015, 0230-0500, 0600-0630, 0930-1330. It was explained "There is no other official broadcasting station in Israel for the time being besides a very small experimental one in Jerusalem which surely you can not receive as its power is in the order of 50 watts." Asked for further reports and was particularly interested in learning identity of the A1 teletype which sometimes blocks signals (6.830).

Woman reads English news 1230-1245. (Pearce, England)

Italy—Radio Italiana, 11.810, is an excellent signal in North Carolina in the daily beam to South Africa 1600-1630, news 1645. (Ormond)

Beams 1030-1200 on 15.120, 11.810, to East Africa; 1215-1550 on 9.63, 11.810, to Europe and North Africa; news 1450; beams to South Africa 1600-1630 on 6.085, 11.810, news 1615. (Bluman, North Africa)

Java—Radio Indonesia, 17.630, 19.345, 15.145, still signs on French program at 1200 with "March Lorraine." (Pearce, England)

Korea—HLKA, 7.935, Seoul, 5 kw., in verifying by letter for Pearce, England, gave schedule 2100-0000, 0300-0900, 1600-1830; no English but does broadcast some classical Western music. Is being heard again early mornings on both East and West Coasts of U. S. May announce occasionally in English as Korean Broadcasting System.

Libya—ISWC, London, reports Forces Broadcasting Station, 11.850, around 1545.

Manchuria—Dilg, Calif., reports

BRAND NEW WAR SURPLUS ELECTRONIC EQUIPMENT

We have been holding our large stock of clean NEW equipment for the export market. Need for space has forced us to offer all of our remaining stock for immediate sale.

NEW two way telephone sets, consist of R-4-29 control and TS-13 handset.
per set \$12.95
Pair 25.00

NEW SCR-269F, automatic direction finder, complete with components 75.00

NEW RA-10, an 8 tube Superhet, tunes 150 kc to 1100 kc and 2 mc to 10 mc, available in 12 and 24 volt models, complete with control box, tuning shaft and plugs (an excellent companion receiver for the BC-375 transmitter) 75.00

NEW BC-375 General Electric transmitter, a complete installation containing tubes, all tuning units, dynamotor and plugs 75.00

NEW BC-221AA Frequency meter, Philco Mfg. 75.00

NEW MN-26C, Manual direction finder receiver, Bendix Mfg. 32.50

NEW MN-28C, Control box for MN-26C 8.50

NEW MN-20E, Antenna loop for MN-26C 9.25

NEW Loop transmission line, for MN-26C 3.50

NEW MC-124, flexible tuning shaft, 60" and 85" lengths 3.00

NEW MC-136, Right angle drive75

NEW BD-77 Dynamotor, 12 volt, export packed 4.95

NEW PE-103, Dynamotor, 6-12 volt, export packed 19.95

NEW Antennas, 25 ft. length consists of 8 sections with Mast base MP-37, per set 7.50

NEW J-48 keys, green crackle finish75

NEW CD-307, Headset extension cords, 5 ft. length50

NEW Insulators, feed through 4 1/2" heavy duty, Stupakoff Mfg.15

NEW Hand antenna reel, for use with SCR-28450

SYLVANIA, KENRAD, TUNGSOI TUBES, BRAND NEW, INDIVIDUALLY PACKED.
1N5 \$.45 1A7 \$.45 1H5 \$.45
305 \$.45 307A \$3.50

ALL TUBES GUARANTEED

NOTE TO ALL SCR-284 USERS AND SUPPLIERS: We have available a quantity of spare parts kits and components, write for details and prices.

ALL ITEMS GUARANTEED AS ADVERTISED

TERMS: 25% with order, balance C.O.D. Shipments F.O.B. our Chicago warehouse, minimum order \$5.00.

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10 ★ SPECIAL

6SA7GT	12SK7
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6V6GT	50L6
12SA7	35Z5

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Orders for 100 asst. tubes **\$35.00**
All tubes carry standard RMA guarantee.

SPEAKER SCOOP

6" P.M. Speaker with 50L6 output transformer **\$1.95**
3 for **\$5.00**

Matched set input and output 456 K.C. I.F. transformers, per set. **\$1.25**
Oscillator coils tapped for 12SA7... .15 ea.
AC-DC Choke39 ea.

TUBULAR CONDENSERS

.01 mfd 200 V. .05	.0025mfd 600 V. .05
.03 mfd 200 V. .05	.004 mfd 600 V. .05
.1 mfd 200 V. .06	.005 mfd 600 V. .05
.3 mfd 200 V. .06	.006 mfd 600 V. .05
.002 mfd 400 V. .05	.01 mfd 600 V. .06
.01 mfd 400 V. .06	.015 mfd 600 V. .06
.015 mfd 400 V. .06	.05 mfd 600 V. .08
.25 mfd 400 V. .08	.25 mfd 600 V. .10
.001 mfd 600 V. .05	.5 mfd 600 V. .12

20 mfd 25 Volt tubular electrolytic... **\$0.19**
10 for 1.45
8 mfd 250 Volt tubular electrolytic... .28
5 for 1.00

Minimum order \$3.00

LIFETRON COMPANY

91 GOLD STREET NEW YORK, N. Y.

XNNR, approximately 7.097, heard mornings with news 0800, announcing location of "Liberated Manchuria." Announcer is on "nightly at 10 o'clock Shanghai Daylight Saving Time." Dilg first heard this station on about 8.844, hence seems to have moved. Appears to sign off 0930. Announced frequency of 7.100. Signal this fall has been fairly good, Dilg reports. A check by *Radio Australia's* monitor in Singapore revealed this station announces both 7.100 and 10.258, is heard daily and Sundays from around 0800 to 0920 sign-off; news 0805-0815, followed by program in Japanese.

Mauritius—Despite much publicity recently to schedules of a station said to be operating from Mauritius, Laub-scher, South Africa, has received this information from the station: "At present we have only a 5 kw. Marconi for medium-wave transmission. I hope that by March next year (1949) we will be in a position to launch a 1.5 kw. new short-wave transmitter." Letter was signed by the manager, Mauritius Broadcasting Service.

Monaco—*Radio Monte Carlo*, 6.035, recently was heard by Pearce, England, in *English*, when woman announcer asked for reports. Heard well in England 1300-1715 sign-off, also in "morning" session which signs on 0100 with march; signs off with dance tune. French is mostly used.

Mozambique—Gillett, South Australia, says Lourenco Marques is heard on about 9.725 around 0820 then has interference from XGOA, Nanking, 9.730; programs are in *English* with usual advertisements. Identifies as "Lourenco Marques for happy listening." Has been heard for some months by West Coast listeners. (Dilg, Calif.)

Northern Rhodesia—Lusaka's 9.710 channel has been a good signal lately on West Coast, opening 1000 with news. Seems much stronger than same time last year; increased power? (Dilg, Calif.)

Norway—Oslo is again using 6.130 for its Home Service. (Bengtsson, Sweden)

Oslo has advised Worris, N. Y., that the fanfare used at the beginning and end of programs has no name. "The fanfare has been specially composed as signature tune for our short-wave transmissions," it was pointed out, "and is built around a very old motif from a Norwegian folk-tune."

Okinawa—OJYN, 19.845, has been heard frequently around 2200 contacting San Francisco; low level and uses but a few words of straight speech, then switches to inverted speech; frequency measured 19.870. (Kary, Pa., Arthur, W. Va.)

Pakistan—Geo. Major, W. Australia, airmails me that *Radio Pakistan* has been heard on approximately 6.062 from 0900, news in *English* 1030-1045; announces "This is Radio Pakistan." Signal good but has sideband interference from *Radio Tananarive* (listed 6.064). Gillett, South Australia, also reports this one and says it carries Indian-type program at 1000; Gillette

November, 1948

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Because of tremendous purchases from a nationally known, first-line manufacturer we are able to bring you these most popular tube types at prices you've never before seen on standard stock. Each tube is individually tested. You'll find no seconds—no defects. Standard RMA guarantee. Money back if not completely satisfied. Take full advantage of this sensational offer today!

1R5	6BA6	6SJ7GT	12AT6	12SK7GT	50B5	50L6GT
1S5	6BE6	6SK7GT	12BA6	12SQ7GT		
1T4	6K5GT	6SQ7GT	12BE6	35L6GT		
3S4	6K6GT	6V6GT	12SA7GT	35W4		
6AT6	6SA7GT	6X5GT	12SJ7GT	35Z5GT		
Your Price						

36¢
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FAMOUS MAKE

ELECTROLYTICS (Tubular)

25 mfd @ 25 volts	30c
20 20 mfd @ 150 volts	45c
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.1 mfd @ 600 volts	15c
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S/C LABS HF-TV ANTENNA



A folded dipole TV antenna with reflector for channels 7 to 13. Provision for clamping easily and quickly to existing mast of any diameter. Connect to LF antenna with short length of twin-lead. Essential for best results on HF band. Your Price **\$3.75**
As above but single dipole with reflector. **\$2.91**

NEW VERTROD HF ARRAY

To mount on existing TV low frequency antenna. All models include mounting means and all hardware. Model HF. HF array only. **\$3.57**
Model HFD. As above but with patented dividing network. **\$6.51**
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MEISSNER MODEL 8C FM RECEPTOR

The FM tuner that everyone's talking about! Audio Fidelity + 2 db from 50 to 15,000 cps! Output better than 3 volts—enough to drive any standard amplifier or the audio system of any receiver. Attractively finished cabinet in polished walnut veneer. Contains own power supply. Simple connections. **\$38.33**
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WEBSTER MODEL 156-27

The Famous Webster 56 with the equally famous G. E. Variable Reluctance pickup built-in. Plays 10-12" records or 12-10" records at one loading. For highest quality reproduction and longest life. **\$28.50**
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WEBSTER MODEL 256

NEW! This newly released Webster model is the same sturdy, dependable 56 but with the added feature of two speeds for playing the new 33 1/3 RPM microgroove long playing records as well as the standard 78 RPM. Your Price **\$34.60**

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Provides additional gain for low output pickups such as G. E. Variable Reluctance, Pickering, etc., for use with conventional amplifiers. Model UPX003, with self-contained power supply. **\$9.57**
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#4—ELECTRIC MOTOR: 1/2 HP, 115 V. 60 Cy. 2900 RPM open type suitable for fans, etc. Single speed \$2.50; Two-Speed \$3.50.

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#6—SELENIUM RECTIFIER: 50-80 ampere fan cooled G-E unit for 6 volt output. May be used at less current without fan cooling and up to 12 volts. \$25; 2 for \$45.

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#9—MOGUL BASE BULB SOCKET: Cleat Type. 600; 2 for \$1.

#10—TRANSFORMER COILS: Approximately 525 turns #25 Formex wound on 1 1/2" x 1 1/2" opening. 50c.

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#14—AMMETER: 0-15 No. 321 Triplett DC. \$4; 3 for \$10.

#15—SPAGHETTI TUBING: Plastic clear #10, in 250' hanks, \$1.75; 4 hanks for \$6.

#16—SOLDERING LUGS: 25 ampere, \$1 per hundred; 50 ampere, \$3.50 per hundred; 100 ampere, \$10 per hundred; 125 ampere, \$4 per hundred; \$35 per thousand.

#17—5-POINT DIAL SWITCHES: Good for 10 to 20 amperes. On transformer applications should be used as 1-point. \$1; 5 for \$4.

#18—BELLS: Monitor type Edwards for 24 volts DC but operates equally as well on AC. Can be used directly on 115 volts. Plated. \$2; 2 for \$3.50.

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gives frequency as 6.085 and says appears either quite low-powered or is beamed away."

Panama—In verifying for Seebold, Calif., HP5A, Panama City, gave frequency 11.700, power 1 kw.

HP5K, 6.005, Panama City, is heard in Louisiana around 0630. In verifying via airmail QSL card, HOLA, 9.505, 1 kw., Colon, *Radio Atlantico*, listed schedule in *English* 0900-1100, 1500-1800, 2100-2200; in *Spanish* 0800-0900, 1100-1300, 1800-2100. (McPheeters, La.)

Philippines—Dilg, Calif., has received some interesting information from WVTM regarding reception of that medium-wave station on high frequencies last spring. The latter stated, in part, "Our answer is the same as your suspicion—Signal Corps radiations; that is, with the exception of April 14, 1948, on 9.790, which was planned. WVTM is a standard broadcast station with a power of 1 kw., operating on 1300 kc. We have no authorized short-wave frequency, except on special occasions when we operate as a relay station for other AFRS stations. Our transmitter and antenna are located at the Air Force Short-Wave Antenna Field, and although all equipment is supposed to be

well shielded, evidently our signal is 'leaking' through to other transmitters, resulting in radiations. We would be interested to note if you are still reading us on short-wave frequencies which you had previously noted." In spring Dilg heard this station about every 7 kc. in vicinity of 10.50 and on 9.790 on April 14 (when seemed a fundamental according to quality at that time); not heard lately, Dilg says. QRA of WVTM is Hq. 13th Air Force, A.P.O. No. 710, San Francisco, California.

First reported to me by Dilg, Calif., and later confirmed by Gillett, South Australia, is KZMB, 6.005, "The Voice of Manila," heard best around 0730. Gillett says this station formerly operated only on medium-wave. *Radio Australia* says is heard from around 0500, announcing "This is MBC, the Manila Broadcasting Company, the 'Voice of Manila.'"

KZPI, approximately 9.500, has been a good signal lately in South Australia to closing 1105; announced power is still 250 watts with 1 kw. used on medium-wave 800 kc. outlet in parallel. (Gillett)

"Voice of America" stations in Manila are scheduled—Manila I, 11.890, 0400-1105 to Far East; Manila I,

IMPROVING BASS RESPONSE OF G.E. MAGNETIC PICKUP

BY DR. JAMES LASSITER

THIS circuit was devised by the author for improving the bass response of a General Electric magnetic pickup.

The output of this circuit is adequate to drive an ordinary amplifier and is remarkably clean. All parts fit into a chassis 7 by 3 by 1 1/2 inches, bent from a sheet of galvanized iron. The placement of parts is not critical but care and the liberal use of spaghetti will reduce hum.

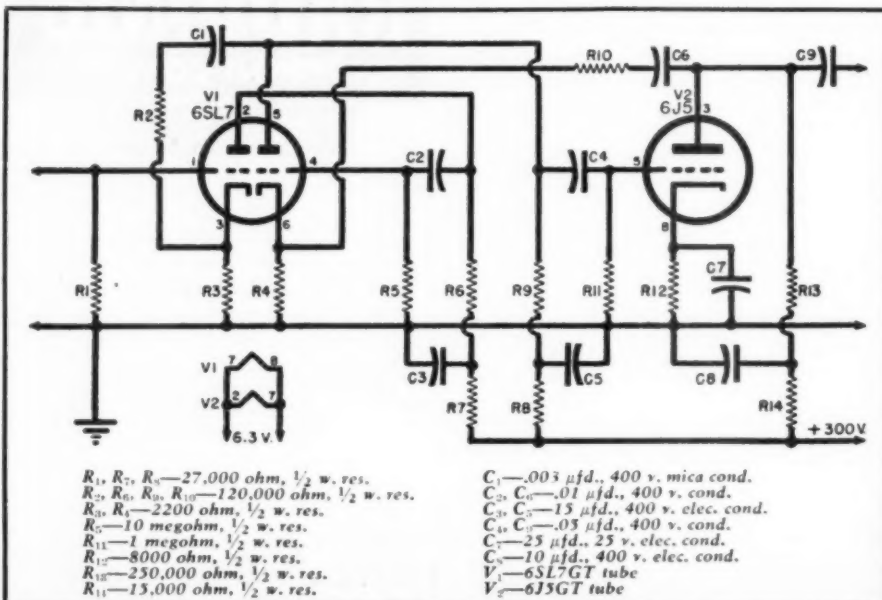
Regeneration is not noticeable at any usable room volume, but becomes severe at very high power. The high frequency response is controlled by the

value of R_1 and in some cases dropping the value to 10,000 ohms may be desirable.

The design is such that an extra low frequency boost comes in at 100 c.p.s. although this may be varied by the value of C_6 . Filament and plate power may be obtained from the associated amplifier power supply and grounding should be done close to the cathode of the first audio stage. To fully appreciate the value of this extra bass, try this circuit with a recording of a good drum solo.

—50—

Diagram of circuit for improving bass response of the G.E. magnetic pickup.



15.330, 0215-0345 (not Mondays) to South East Asia with UN programs.

Poland—Despite the fact that "Radio Polskie" wrote Kary, Pa., some time ago disclaiming broadcasts on approximately 9.530 that were believed to come from Warsaw. Miss Dorothy Sanderson, Australia, has now received a reply to her report on these transmissions and the station confirms they had run tests on 31.48 meters. Heard there recently?

Portugal—CS2MF, 9.724, Lisbon, comes in well in Chicago in its daily 1900-2030 transmission to North America.

The Portuguese outlet on 15.100 broadcasts daily for Portuguese in Africa 1230-1530 in parallel with CS2-MK, 11.027, Lisbon. (Radio Australia)

Rhodes—Kary, Pa., has received verification from the portable mobile station with UN on Rhodes; call is 4UN, frequency of 14.996, and transmitter used was SCR 399 (U. S. Army), 400 watts, with whip antenna.

Roumania—Bucharest, 11.900, 9.520, has news 1500-1530. (Pearce, England)

Sweden—SDB-2, 10.780, and SBT, 15.155, have been good signals lately in the 1900-2000 program to North America, news at start; have DX session Saturdays at 2000. (Glenn, Pa.) The DX program is also heard well Saturdays 1000 on SBT, 15.155.

Switzerland—International Red Cross, 6.345, Geneva, has information news bulletin daily 1240, 1540. (Pearce, England)

European Service is heard on HE15, 11.715, and HER3, 6.165, Berne, 0400-0140 (Sundays) and daily 0020-0140, also at 1200-1700. No English noted. (Pearce, England)

Trinidad—Radio Trinidad, approximately 9.625, has improved signals early mornings; BBC news relay 0600.

Has been heard in Australia with excellent signal. (Sanderson)

United States—WRUX, 25.600, is now scheduled on 25.600, 1100-1400, to Europe.

USSR—Radio Moscow's North American periods are announced for 0745-0815, 11.81, 11.88, 15.17, 15.39, 15.41, 17.83; 1820-1930, 11.71, 11.87, 11.88, 11.96, 15.23, 15.39; 1930-1950 only 11.71, 11.96. (McPheeters, La.)

The Moscow beam to Latin America is 2000-2029 in Portuguese (presumably for Brazil) and 2030-2230 in Spanish on (announced) 11.89, 11.72, 11.96, 11.63, 9.66. (Worris, N. Y.)

Petropavlosk, 6.070, has recently been one of the best signals in East in 49-m. band around 0530; easily recognized by poor modulation. (Kary, Pa.)

Huse, Washington, reports Khabarovsk, 8.820, with good signal 0400-0500, but has code interference, noise, and poor modulation; no English noted.

Fargo, Ga., reports Radio Moscow with an English session 1230-1330 on approximately 15.40. (This is probably beamed to Britain.)

Vatican—HVJ's 31-m. outlet has

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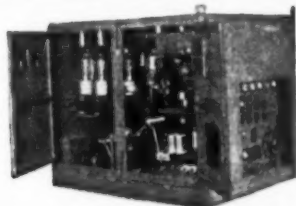
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moved from 9.660 to 9.640. (Fransson, Sweden)

Gillett, South Australia, has heard HVJ on approximately 15.100 calling Madrid at 1115.

Venezuela — Y V K C, Radiodifusora Nacional de Venezuela, has notified Morgan, Pa., that "at present our programs are broadcast in Spanish but soon we shall begin transmissions in English. We have purchased a RCA short-wave transmitter of 50 kw. power which will be installed soon."

YV5RM, 4.915, and YV5RN, 4.920, are in dual to closing 2030; Spanish only.

Last Minute Tips

Edward Bonong, chief engineer, Radio SEAC, Colombo, Ceylon, confirms to me that the 15.230 transmitter radiates with 7.5 kw. while the 15.120 outlet uses 100 kw. Current schedules are Main Program, 2330-0130 and 0530-1115 on 15.120, 17.730 (except between 0700-0715), 6.075, 9.520, 3.395; on Saturdays and Sundays transmissions begin at 1930; Ceylonese Forces Program, 0700-0715 on 17.730; the special Sunday transmission to Great Britain at 1230-1430 is carried on 15.120 and 17.770 to British Isles, and on 3.395, 6.075, and 9.520 to other areas (India, Asia, etc.). The 15.230 channel is used only for special broadcasts—such as the recent relay of cricket matches from the BBC, London.

The New Zealand Radio DX League lists XOPB, Chekiang, China, 12.120, 500 watts, 1930-2230, 0030-0930; XKPB, Shansi, 9.500, 200 watts, 1930-2030, 2200-2300, 0430-0955. (Cushen, New Zealand)

Laubscher, South Africa, has received a reply to his report to Radio Diamang, Angola; address is Director, Companhia de Diamantes de Angola, Dundo, Angola. Radio Diamang is operated solely for the entertainment and culture among personnel (company staff and diamond-mine workers). Is scheduled 1330-1430 daily and 0400-0500 Sundays; call is CR6RG and frequency is 8.242. Uses a locally-constructed transmitter pushing 300 watts into Zepp half-wave antenna. They so appreciated Laubscher's report that on August 21 they dedicated a special period of classical music (half-hour) to him, announced in English and presented outside regular broadcasting hours, that is at 1500-1530.

Latest Angola outlet reported by Laubscher is Radio Club de Bie, Silva Porto, Angola, on approximately 7.550, heard with strong signals 1200-1300. Laubscher points out, incidentally, that CR6RS is not Radio Clube de Angola but Radio Clube do Sul de Angola.

Anyone abroad wishing pen-friends through the Swedish Radio should write to "My Friend Abroad," Stockholm C, Sweden. (Skog)

Sanderson, Australia, reports XNCR, Communist-controlled Chinese outlet on approximately 9.390, heard at 0615 with Chinese news followed by Western music.

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RADIO & TELEVISION NEWS

Paris for relaying UN General Assembly broadcasts are 17.765, 11.845, 15.100. (Stibb, Wisc.) Transmitters are located 150 kms. from Paris.

Tashkent, Uzbek, USSR, 6.820, has extended its *English* service for the Far East, now broadcasts each Wednesday, Friday, Sunday at 1200-1230; station is heard well in Sweden, asking for reception reports and comments on programs. (Swedish DX Program)

Bandoeng, Java, is heard by Woodruff, Calif., on approximately 10.40 to closedown 1000.

Beirut, 8.030V, "The Arab Voice of Lebanon," has *English* period now 1100-1140, news 1100. (Bluman, North Africa, via Radio Australia)

YDC, 15.150 (announced, but actually 15.145), Batavia, *Radio Indonesia*, is scheduled 0300-1300; *English* 0600-0700 to Australia; 1000-1100 in French to Indo-China; 1200-1230 French to Europe; 1100-1200 Dutch for Holland; 1230-1300 Arabic for Middle East; 0800-0830 Arabic. (Dilg, Calif.) Sometimes around 0925, 11.767 and 7.275 are in parallel.

Some time ago, *Radio Australia* announced that *Radio Athens* had been heard testing on announced 17.745 at 0900-0945, actually on 17.75, according to Herbert Bluman, North Africa; used Greek, French, *English*.

P. Jankowski, Radio Officer, European Office of the United Nations, Geneva, Switzerland, informs me that UN programs are scheduled in *English* daily at 1300 and 1600, followed each period by French language transmission; *not on Sundays*; each language takes 10 minutes. Russian is scheduled Mondays, Thursdays 1340-1350, and Polish is used those days 1350-1400. The *English* and French transmissions are carried on both 6.672 and 18.450, but the Russian and Polish transmissions are radiated on *only* 6.672. Mr. Jankowski comments that "We have been broadcasting regularly for about six months, and judging by fan-mail, have quite a considerable and faithful audience." In a letter to Kary, Pa., it was stated "Many people have said that they would like to hear news about international cooperation and about the United Nations, from a completely objective source. This is what *United Nations Radio*, Geneva, is trying to give them. We work with a small personnel and do not attempt to compete with larger broadcasting systems. By being absolutely impartial and friendly in its approach, *United Nations Radio* is trying in a modest way to provide listeners in many countries with reliable information about world affairs. Comments, criticisms, and suggestions are always welcome and should be addressed to United Nations Radio, Geneva, Switzerland. Call signs are HBF for 18.450 and HBU for 6.672.

PCJ, Hilversum, Holland, was heard testing recently to Indonesia at 0600 on 15.220, 17.775, 21.480. (Carlberg, Sweden)

Bluman, North Africa, has informed *Radio Australia* he has been hearing

November, 1948

LIVE WIRE NEWS

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- SCR-518-A, 6 large, clear schematics with explanatory notes, frequencies, band-pass and complete reprint of the manual. \$2.00
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- MN-26 receiver, MN-26 control box, IN-4 indicator schematic, interconnections, conversion to 14 V, etc. \$1.00
- MN-26 operation and maintenance manual. 145 pages. \$5.00
- BC-348-M, K, L, or R schematic plus AC power pack and connection instructions. \$1.00
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- BC-946-B, step-by-step conversion and schematics, pictures, etc. Delayed AVC and 2-stage audio. 12 8 1/2" x 11" pages. \$2.00
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- T-85/APT-5, power unit, 60 cy. power information, freq. and mod. adjustments, chart of counter settings, operation instructions, etc. \$1.00
- DZ-2 schematic. At last I've got it. Photostat. \$3.00
- Wilcox CW-3 receiver schematic with typical installation interconnections. \$1.00
- BC-658 and PE-117 schematic. Both. \$2.00
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- RU-17/GF-12 equipment schematic. \$2.00
- ID-6A or B/APN-4 schematic (please specify A or B). \$2.00
- R-9A or B/APN-4 schematic (please specify A or B). \$2.00
- BC-654 revr. xmttr schem. Both. \$2.00
- PE-103 with explanation. \$1.00
- BC-603, BC-604 schematics. Both. \$2.00
- BC-683, BC-684 schematics. Both. \$2.00
- System Schematic for BC-683, 684, applicable also to BC-603, 604. \$1.00
- BC-983, BC-984 schematics. Both. \$2.00
- System Schematic for BC-983, 984. \$1.00
- SCR(-) 283 equipment schematic, includes BC(-) 429, 430; use also for SCR(-) 183, BC(-) 229, 230. \$2.00
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Sharq-al-Adna (which he lists as now located at Amman, capital of Trans-Jordan) on 18.510; believed to be harmonic of 6.170. He says this station now uses a fourth channel, 9.650, in parallel ZJM5, 6.170, ZJM6, 6.790, and ZJM7, 11.720, to 1530 closedown daily.

Chavez, Cuba, reports Manta, Manabi, Ecuador, on 9.860 at 1930-2200, announcing "La Voz de la Democracia;" all Spanish; good level in Cuba but has CWQRM at times.

Our thanks go to Hans F. Breitbarth, a columnist for the widely-circulated newspaper, "El Panama America," in Panama City, in encouraging through his column that Latin-American broadcasters use the English language more freely.

Huse, Washington, reports HLKA, measured 7.933.5, Seoul, Korea, at 0300-0715; no English heard except occasional station identification.

XEFT, 9.548, Vera Cruz, Mexico, generally has strong signals after 0000; news in Spanish at 0000; announces "XETF. La Voz de Vera Cruz" (medium-wave call). (Kary, Pa.)

Paris, 6.200, opens 0000 with news in French; Strong signal. The 9.550 channel parallels; 6.200 leaves the air 0015, but the 9.550 outlet leaves A carrier on to 0030 when begins again in French. Apparently 6.200 is used only 0000-0015 for this transmission. (Kary, Pa.)

The Forces Broadcasting Station, Cyprus, is heard by Kary, Pa., on measured 7.214.5 apparently opening 2200. Berkstrom, Sweden, says this is definitely JCKW, moved from Jerusalem, and now located at Nicosia; heard in Sweden at 1700.

Late tips from Balbi, Calif., include Bandoeng, 4.855, Java, 0800-0930, weak to fair; XGOA, 5.985, Nanking, fair 0500-0915; KZMB, 6.000, Manila, 0430-0930, bad CWQRM usually; Indo-China on 6.095, all French, 0830-0930, QRM bad at times; Chinese outlet on 11.850 at 0430 and later, weak to fair, may be XORA, Shanghai (?); CBFX, 9.610, Montreal, signs on 2300, replacing CBLX, 15.090; XGOY, 11.913, Chungking, has replaced 15.170 for 0830-1040 period. Balbi is hearing a station on

ELECTRON-RAY INDICATOR FOR DYNAMIC NOISE SUPPRESSOR

By ROBERT W. TIMMERMAN, W8YIF

A USEFUL addition to a dynamic noise suppressor is an electron-ray indicator tube such as those commonly used as "tuning eyes" in radio receivers. This tube can be made to indicate the opening and closing of both the high-frequency and low-frequency gate circuits. Ability to observe both of these variables continuously and simultaneously is very helpful in adjusting the circuits for optimum performance, and is advantageous in demonstrating the operation of the unit.

The type 6AF6G tube is actually a double vacuum-tube voltmeter, which indicates by the shadow angles on its fluorescent screen two independent voltages applied to the respective control electrodes. With zero voltage on a control electrode the corresponding shadow is a sector of approximately 90 degrees. Increasing the voltage between the control electrode and cathode causes the angle to decrease, until at about 160 volts the angle reaches zero and the "eye is closed."

A reactance tube, as used in the dynamic noise suppressor, is connected so that when the gate circuit is closed, the control grid voltage is near zero, the tube is conductive, and because of the high resistance (470,000 ohms) in the plate circuit the voltage at the plate is very low. As the gate is caused to open by increased negative grid voltage, the tube becomes less conductive, the plate current decreases, and the voltage at the plate increases. As the grid voltage approaches the value necessary to cause plate current cut-off, the potential at the plate of the tube approaches the supply voltage (250 v.). Therefore, to obtain an indication of the gate circuit conditions, it is necessary only to measure the reactance tube plate voltage. The circuit diagram (Fig. 1) shows how this may be done with the 6AF6G tube.

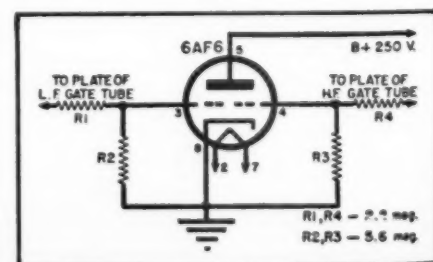
In order not to disturb the functioning of the reactance tubes, high-resistance measuring circuits are used. R₁-R₂ and R₃-R₄ constitute voltage dividers which limit the maximum voltage that

can be applied to the control electrodes to a value just sufficient to close the eye. Slightly different values of R₂ and R₄ from those shown may be necessary in a particular installation. Closing of the sector should be checked with the suppression control switch in the "off" position. With the circuit adjusted for maximum suppression and no signal applied, the shadow angles should be at maximum, around 90 degrees. If the shadow angle remains small under these conditions, the reactance tube is not conducting as it should. If it is certain that the control grid voltage is correct (approximately zero), a slight adjustment in screen voltage may be required.

After a little practice the conditions and performance of the D.N.S. can be ascertained by a glance at the ray-tube patterns. The dynamic range is indicated by the magnitude of the shadow fluctuations. The absolute frequency range at any instant is also shown, wide angle indicating restricted range and narrow angle wide range. In addition to its value in adjusting the controls, the action of the shadows is quite entertaining, and vividly demonstrates the difference in time constants of the low-frequency and high-frequency control circuits. The high frequency indicator fluctuates rapidly, with each note of music; the low frequency indicator opens and closes only with the general trend of loudness.

—30—

Fig. 1



9.840 at 0500-0930, bad CWQRM, announcing "Radio Sario" and "Radio Nederlands;" says may be Java. This one has been heard for some time by Stark, Texas, who believes it to be Menado, Celebes. *Can anyone confirm location?*

DAKU, 15.920, commercial transmitter formerly operated by RCA Communications, Inc., now is owned and operated by Press Wireless, Inc. Has 7.5 kw. power using rhombic antenna; located in Germany. (Kary, Pa.)

German radio telephone channels to Argentina and Brazil operate daily on DFU, 17.520; DFB, 14.410, DFM, 19.460, and DLO, 19.975; telegraphy transmissions from Germany to various South American countries operate on DGM, 9.795; DFR, 15.593; DGQ, 20.500; DGJ, 13.375; DFV, 19.443, and DGS, 22.800. (Kary, Pa.)

The Control Commission in Germany now has a transmitter radiating the *Nordwestdeutscherundfunk* programs from Hamburg on 7.290 with 50 kw. Antenna is an omni-directional for Europe; scheduled 2300-1730. (Kary, Pa.)

Karl Schwarz, Vienna, informs me the new Bogota station on 9.520 is heard in Austria at 1830-1930, good level. Karl also reports BFEBS, 15.300, Singapore, fine signal at 0930-1130 closedown.

Dilg, Calif., reports a station on 4.985 announcing "Radio Malaya," location unknown; bad CWQRM; relays Singapore Red and Blue Networks, but when heard was *not* in dual with either Kuala Lumpur (approximately 6.030) nor Singapore's 4.825 outlet. At 0745 carries Malayan program and has *English* 0745-0900; fades out around 0930. Station heard by Dilg on 4.845 is believed to be Medan, Sumatra, probably moved from 7.210; takes relay from Holland 0800 and Dutch news from Batavia at 0900. Dilg flashes that XNNR is at Harbin, Manchuria, on measured 7.098, scheduled 0500-0935.

Acknowledgement

Many thanks for the fine reports coming in. A new DX season is just getting under way for many readers. May it be a successful and profitable one! . . . K. R. B.

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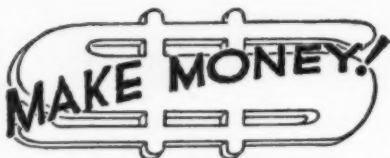
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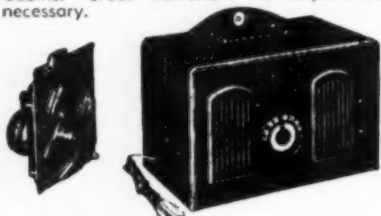
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AM-FM Receiver (Continued from page 64)

quired for a stated output gives the transfer impedance of the first i.f. transformer. The deviation of this value from the value obtained with subsequent circuits heavily loaded gives an indication of the amount of feedback present, insofar as the first i.f. transformer is involved. In the receiver described, the indicated transfer impedance changes from 7050 ohms to 6500 ohms when the plate winding of the second i.f. transformer is shunted with a resistor of 5100 ohms. The amount of feedback required to produce this change is considered small enough to be satisfactory.

The primaries of the i.f. transformers for both AM and FM are connected in series, but in the FM position, the AM winding for the first i.f. transformer is short-circuited. In the AM position, it was noted that a considerable d.c. voltage develops across the electrolytic stabilizing condenser of the ratio detector at a number of discrete frequencies. Investigation showed these frequencies were amplified harmonics of the AM oscillator frequency and corresponded to oscillator frequencies of one-fifth, one-sixth, etc., of 10.7 megacycles. The AM performance did not seem to be impaired, but it may be preferable to arrange the switch to short-circuit or disconnect the FM i.f. transformer winding when the AM system is in use.

From Fig. 2, it can be seen that the oscillator-grid circuit of the 12BE6 is switched to change from FM to AM. The diagram is shown for the FM band. The oscillator circuit for FM is of the Colpitts type to avoid switching the cathode. In an earlier design in which a Hartley-type oscillator circuit was used for both AM and FM, considerable difficulties with parasitic oscillation were experienced in trying to switch the cathode lead. A tri-

flar choke, consisting of three wires twisted together and then wound as a coil, provides impedance to ground for the cathode and the two heater leads. The ratio of the internal capacitance between cathode and screen grid to the capacitance between oscillator grid and cathode determines the feedback. It was found that when a small amount of capacitance is added between cathode and oscillator grid, the oscillation is increased. Use of a 4.7 μ fd. condenser gives a minimum d.c. voltage at the oscillator grid of 3.5 volts, a plate current of 1.9 milliamperes, and a screen current of 7.5 milliamperes. The sensitivity can be increased 10 per-cent by omitting the external grid-to-cathode capacitance, but the added margin of safety obtained by maintaining the higher oscillator voltage is considered more important than the improvement in gain.

Operating the heater and cathode of the converter tube at the same r.f. potential avoids microphonics caused by variations of heater-cathode capacitance due to vibration. The resistance in the signal grid of the 12BE6 is kept low so that any grid current will not bias the tube and thus reduce the conversion gain.

For both FM and AM the oscillator is operated at its fundamental frequency which is above the signal frequency. The FM tuning range is 86 to 111 megacycles and the AM range is 530 kilocycles to 1620 kilocycles.

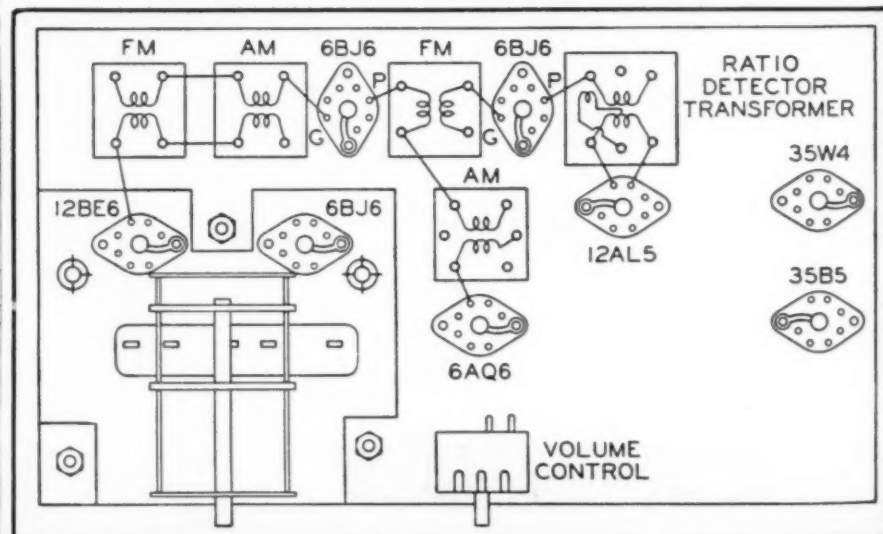
The r.f. stage is tuned for the FM band and untuned for the AM band. The wafer switch simply connects the FM tuned circuit in parallel with the AM untuned circuit. An AM i.f. trap is included as part of the AM inter-stage circuit.

The grid of the 6BJ6 r.f. amplifier is switched from the AM tuned input circuit to the FM tuned input circuit. The FM antenna winding is coupled closely to the FM r.f. coil.

Gain and Noise Measurements

The over-all gain of the r.f. and converter unit at FM frequencies can be defined as the ratio of the i.f. volt-

Fig. 4. Mechanical layout of chassis viewed from the bottom.





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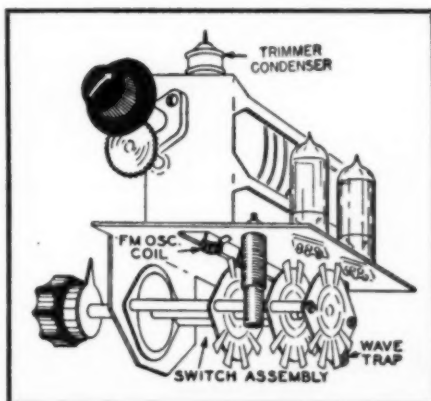
age at the first i.f. grid required to produce a specified output to the r.f. input voltage required to produce the same output. The r.f. input voltage is measured at the signal generator terminals with a 300-ohm dummy antenna connected between the generator and the antenna terminals of the receiver. The value obtained by dividing the current input required at the converter plate by the voltage r.f. input is a better index of r.f. unit performance, because the first i.f. transformer is thus excluded. Neither measurement, however, can give information about the performance of the separate stages and the individual components used. The procedure used to obtain this information follows.

An r.f. signal is introduced at the signal grid of the converter through a 300-ohm resistor and an adjustable series condenser. The condenser consists of two lengths of hookup wire twisted together. Fig. 6 is a sketch of this arrangement with the equivalent circuit applicable to the type of measurement discussed. The series condenser is adjusted to the value requiring the minimum input for a given output by twisting, untwisting, and cutting the wires. The amount of capacitance used may be measured, and from this value the approximate conductance reflected from the 300-ohm resistor can be computed. This data is useful in pointing out excessive circuit losses. This measuring technique has the advantage that the input required for a given output does not depend critically on the point at which the condenser is connected. Estimates of conductance made by this method do, however, apply to the specific connection points.

The same method may be used to introduce a signal into the grid circuit of the r.f. tube. Comparison of the input required for such a test with the input required when the signal is introduced through the antenna terminals gives information as to the efficiency of the antenna coupling circuit provided.

Performance data for the r.f. unit is given in Table 3. Data for the FM band was obtained by the method described. Conventional methods were followed in obtaining the AM data. A uniform gain of 4 for the 12BE6 con-

Fig. 5. Sketch of r.f. sub-assembly.



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.6 "	33,000	750	
.268 "	13,300	235	
.22 "	12,000	130	
125,000	10,000	125	
120,000	7,500	110	
109,000	4,500	55	
100,000	4,300	22	
95,000	4,000	20	
92,000	2,500	14	
84,000	2,230	12	
82,000	2,200	10	
80,000	1,700	6	

Following sizes are 5% or better tolerance,			Price \$1.15
22,000	70	50	
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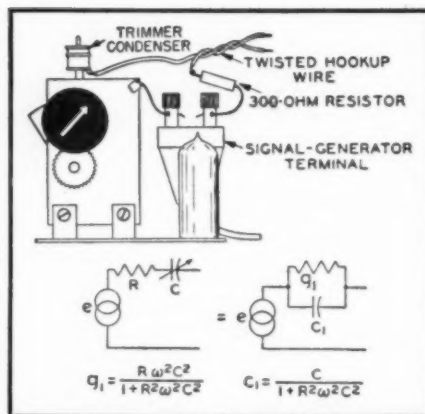


Fig. 6. Setup for making r.f. measurements.

verter is obtained over the FM band. The over-all FM front-end gain measured with a 300-ohm dummy antenna varies from 24 at 105 megacycles to 28 at 90 megacycles.

Receiver noise in the FM band was measured by determining the signal input at which a change from zero to 30 per-cent frequency modulation increases the audio power output by 30 db. The required signal level at 96 megacycles is 31.0 microvolts. In the AM band, the equivalent-noise-sideband input is 3.1 microvolts per meter at 1000 kilocycles.

Frequency Stability

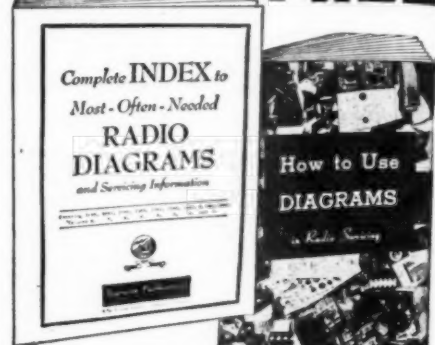
The oscillator frequency drift during the first 15 minutes of chassis warm-up is 75 kilocycles at a signal frequency of 100 megacycles. Compensation for this drift can be effected by connecting a 5 μ fd. condenser having a negative temperature coefficient of 750 parts in a million per degree C between the screen-grid terminal and oscillator-grid terminal of the 12BE6 socket.² With this compensating condenser, the warm-up drift is reduced to approximately 20 kilocycles. These tests were made with the receiver in the open, so it is probable that further adjustments would be required to obtain compensation when the receiver is in a cabinet.

Conclusions

The problems encountered in the construction of this a.c.-d.c. receiver were not too much different from those of an a.c. design. The 6BJ6 tubes give good performance in the r.f. and i.f. stages. The current required for the receiver is below the maximum rated value for the 35W4 rectifier and the rectified voltage obtained is sufficient to give satisfactory operation of the 12BE6 and 6BJ6 tubes. The 12BE6 can give as good performance in a circuit which includes high-frequency switching as it can in a circuit without switching. The circuit and the physical layouts must, however, be such as to permit short leads; the penalty for failure to observe this precaution is low gain and, frequently, parasitic oscillations.

As to whether an a.c.-d.c. receiver
² RCA Application Note No. 122, "Compensation of Frequency Drift."

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for both AM and FM reception will cost less to manufacture than an a.c. AM-FM receiver the answer is problematical, but there is no doubt that both will cost considerably more than a receiver for the AM broadcast band alone. An a.c.-d.c. AM-FM receiver does have the features of being smaller in size and lighter in weight than an a.c. receiver employing a power transformer.

-50-

SCHONING NEW RPEES PREXY

WILLIAM O. SCHONING of Lukko Sales Corp., Chicago was elected president of the Radio Parts and Electronic Equipment Shows, Inc., sponsors of the annual Radio Parts Show. Robert C. Sprague, Sprague Electric Co., North Adams, Massachusetts was elected vice-president; John L. Robinson of Croname, Inc., Chicago was named secretary, while Walter W. Jablon of Espey Mfg. Co., New York will serve as treasurer.

Mr. Schoning represents NEDA on the board, Mr. Sprague represents RMA while Mr. Robinson and Mr. Jablon represent the Association of Electronic Parts and Equipment Manufacturers and Sales Managers Club, Eastern Division, respectively.

Other directors elected include Jerome J. Kahn, Standard Transformer Corporation (RMA); Les A. Thayer, Belden Mfg. Co. (EP&EM); Aaron Lippman, Aaron Lippman & Co. (NEDA); Charles Golenpaul, Aerovox Corporation (SMED); and Lew Howard, Triad Transformer Co. (WCEMA).

The Show Corporation confirmed a four-day Show plan for 1949 at the Stevens Hotel in Chicago to run from Tuesday, May 16th through Friday, May 19th. On Thursday, May 18th, the Show Corporation will join with the Radio Manufacturers Association in an all-industry dinner to honor RMA's twenty-fifth anniversary. Leslie F. Muter of the Muter Co., Chicago, was named a guest member of the Show Committee's banquet and publicity committees to facilitate arrangements for the dinner program.

The Board also voted to recommend to the sponsoring groups that the 1950 trade show be held at the Hotel Waldorf-Astoria in New York.

-50-



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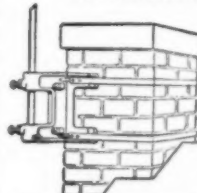
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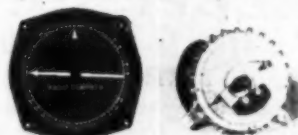


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.25 1000 V	.35	.00025 5000 V	.85
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.25 6000 V	3.75	.00072 5000 V	.85
10x.25 600 V	1.05	.0008 5000 V	.85
.5 600 V	.20	.0001 2500 V	.25
.5 1000 V	.40	.0011 5000 V	.85
.5 2000 V	.75	.002 1200 V	.20
.75 2000 V	.60	.002 3000 V	.65
.77 330 VAC	.30	.003 2500 V	.30
1.0 1000 V	.45	.003 3000 V	.65
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4.0 600 V	.60	.006 2000 V	.35
4.0 1000 V	1.00	.008 1200 V	.15
5.0 220 VAC	.55	.01 1200 T.V.	.15
6.0 1000 V	1.45		
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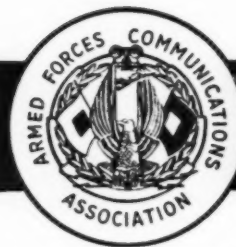
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AFCA News

1949 Convention

Initial plans for next spring's annual meeting were made at a conference held on September 9th. Present were: General S. H. Sherrill, AFCA Executive Secretary; Admiral Earl E. Stone, Chief of Naval Communications; Admiral Edward C. Ewen, Chief of Naval Public Relations; Capt. Robert Foley and other members of their staffs; Mr. Frederick G. Macarow and Col. E. C. Cover, President and Secretary of the Washington Chapter which will be host to the convention.

Amateur Radio Organization

Lt. Col. George R. Call of Sioux City, Iowa, appointed last May as chairman of the AFCA committee to study the possibility of radio "hams" being better organized for an emergency, has submitted his first report and has made two visits to Washington to gather necessary information. On August 25th and 27th he conferred with the Executive Secretary and with officials of the Army, Navy, and Air Force.

September "Signals"

This issue of AFCA's magazine was dedicated to the Navy in honor of Navy Day, October 27th. It included articles on the Navy Electronics Laboratory, Coast Guard communications, the Marines' code talkers, Navy communications training, and other interesting articles.

Chapter Notes

European

On August 14th, 168 members and guests of the European Chapter boarded the yacht "Gutenberg" at Frankfurt and attended the second quarterly meeting of the chapter which was combined with an eight hour cruise of the Main and Rhine Rivers. Major General Jerry V. Matejka, Chief Signal Officer of EUCOM, addressed the members and commended the progress being made by the chapter.

A European Advisory Committee, to represent the three services, was appointed as follows: Col. R. W. Raynsford, Army; Col. D. C. G. Schlenker, Air Force; and Commander R. B. McCurdy, Navy. Representation on the Membership Committee was extended to include the Air Force; OCSigO, EUCOM; Frankfurt Signal Office; Constabulary; 1st Division; and the Navy. It was decided to extend guest membership in the European Chapter to Generals Clay, LeMay, Keyes, Milburn, Huebner, White; Admiral Schuirmann; Ambassadors Murphy and Erhart; and the Post Commanders and Commanding Officers of the Naval Advance Base at Bremerhaven.

Los Angeles

The initial meeting to form a Southern California Chapter of AFCA was held on October 15th at 8 p.m. at KMPC Studio A, 5939 Sunset Boulevard, Los Angeles. The meeting was preceded by a dinner at the Palms Grill. The main speaker was Capt. Harry C. Butcher, Naval Aide to General Eisenhower and author of the book, "My Three Years with General Eisenhower."

Richmond

Officers and committee chairmen of the Richmond Chapter met on September 9th to formulate plans for fall activities. The first dinner-meeting of the chapter was held on October 12th. General S. H. Sherrill, National Executive Secretary, came down from Washington to address the members.

Sacramento

The Board of Directors of the Sacramento Chapter met on August 25th at the Sutter Club. Present were: Lt. Col. Wesley E. Calkins, McClellan Field, Air Force Counsel; Milton G. Mauer, Div. of Commercial Engineers, PT&T; Paul Carrington, PG&E; Robert D. Livingston, President, Junior Chamber of Commerce; George H. Brereton, Chief, State Div. of Identification; Waldeman E. Doyal, Sierra Camera Club; George H. Melvin, Executive Secretary, Sacramento Chapter; and H. M. Skidmore, Public Information Officer, Sacramento Signal Depot. Col. Stewart W. Stanley, Commanding Officer of the Sacramento Signal Depot, who attended as a special guest, was appointed Signal Corps Counsel for the Chapter.

Seattle

The Seattle Chapter held a dinner meeting on August 5th at the American Legion Hall. The speakers were Col. Fred Andrews, former Commanding Officer of the Alaska Communication System, and Major Joyce B. James of ACS. The feature of the evening

was a talk and demonstration on Micro-wave Phenomena presented by Mr. J. Key, Demonstration Supervisor of the Pacific Telephone & Telegraph Company.

Spanish War Veterans Division

The officers of the Spanish War Division of the U. S. Veterans Signal Corps Association have accepted an invitation to become an honorary division of AFCA. The U. S. Veterans Signal Corps Association was organized by Signal Corps veterans of the Civil War in 1867. The Civil War Division was disbanded in 1919 and the Association has been continued in existence by the Spanish War Division, which was organized in 1899.

There are some 300 members of this Association throughout the United States, of whom about thirty attended the annual encampment of the United Spanish War Veterans in Washington, August 22nd to 26th. At the Veterans luncheon at the Hotel Hamilton on August 24th, John White of Dallas, Past Commander, United Spanish War Veterans, was the principal speaker. Col. E. C. Cover, Secretary of the Washington Chapter of AFCA, spoke concerning the activities of his chapter, and Brig. Gen. S. H. Sherrill, Executive Secretary of AFCA, addressed the delegates, outlining the aims and purposes of AFCA, and extended the invitation for the Spanish War Signal Corps Veterans to become an honorary division. Officers of the Spanish War Veterans Division, AFCA, were elected as follows: Asa T. Pierce, Commander, and George A. Marshal, Adjutant.

-30-

SHIELDED WIRES

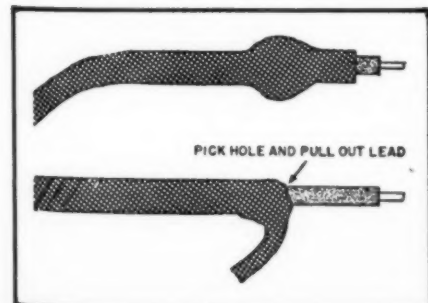
BY FREDERICK BAUER

TO make a neat end on shielded wires, that is, to separate the shield from the wire near the end which is to be connected, the following technique can be used.

First, push the shield back so that the bulge is about where you wish to have the point of separation. Next, bend both the shield and wire almost double. Now, with an ice pick or other sharp pointed tool enlarge a hole at the top of the bulge sufficiently to allow the double wire to be pulled out through the side of the shield.

The shield and wire can then be straightened out, leaving a neat end to be connected to your equipment. -30-

Method of preparing a shielded cable in order to make a neat and safe connection.



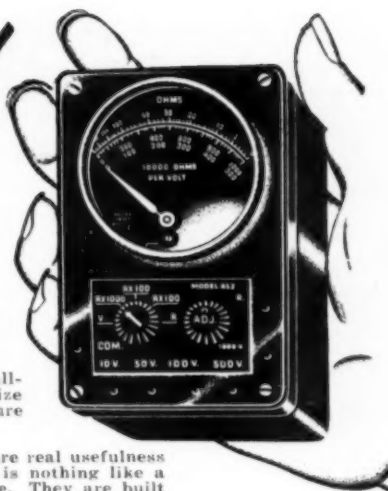
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ERRATUM

In the article "A Portable, Lightweight, 1-Tube Stroboscope" by Rufus P. Turner, appearing on page 38 of the September issue, the stroboson tube used in the instrument was given as a type 2D21. This is in error and should be the type 1D21. Our thanks to Sylvania Electric Products Inc. for calling this matter to our attention.

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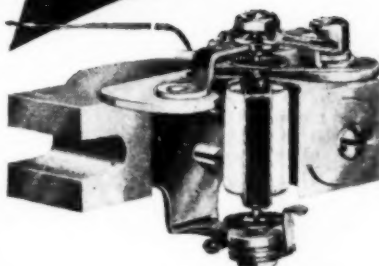
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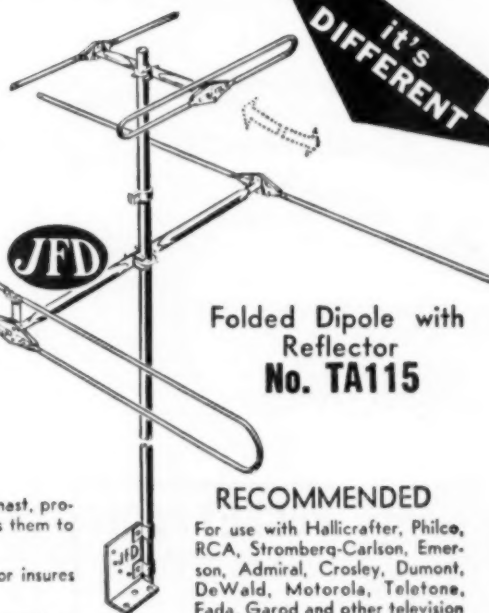
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INDEX OF

Advertisers

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ADVERTISERS Page No.

A. M. Radio Sales Co.	186
Abell Distributing Co.	126
Aberdeen Auto Parts	136
Ace Surplus Sales Co., Inc.	86
Acorn Electronics Corp.	173
Acoustcraft Corporation	192
Air King Radio, Division of Hytron Radio & Electronic Corp.	32
Airborne Sales, Inc.	206
Allied Radio Corp.	9
Almo Radio Company	202
Altee Lansing	182, 160
Alvaradio	191
American Phenolic Corporation	171
American Radio Institute	120
American Sales Co.	130
American Surplus Products Co.	97, 98, 99
American Television and Radio Co.	179
Amperite Co.	205
Amplifier Corp. of America	18, 116, 195
Arrow Sales, Inc.	110, 111
Ashe Radio Co., Walter	119
Audel Publishers	122
Audioview Radio Parts Co.	124
Audio Development Co.	181
Baltimore Technical Institute	112
Belden	83
Bell Telephone Laboratories	24
Billey Electric Co.	16
Bliss Electrical School	140
Boland & Boyce, Inc., Publishers	142
Bradley Associates, Inc.	190
Bradshaw Instruments Co.	202
Brook Electronics Co.	156
Brooks Radio Dist. Corp.	128
Burlington Instrument Co.	207
Burstein-Appelbee Co.	125
Buyers Syndicate	136
C. & H. Sales	142
Cal-Perry Corp.	172
Candler System Co.	208
Cannon Electric Development Co.	146
Capitol Radio Engineering Institute	27, 101
Central Television & Radio School	201
Centralab, Division of Globe Union, Inc.	20, 21
Certified Television Laboratories	195
Chicago Industrial Instrument Co.	205
Chicago Transformer, Division of Essex Wire Corp.	30, 31
Cinematograph Speakers, Division of Aeron Mfg. Corp.	179
Cinex, Inc.	140
Cleveland Institute of Radio Electronics	34
Columbia Electronics	109
Columbia Wire & Supply Co.	176
Comet Electronic Sales Co.	149
Commercial Radio Institute	132
Communications Equipment Co.	155
Coradio	189
Cortley Television Corp.	188
Coyne Electrical & Radio School	148, 201
Crystal Devices Co., Inc.	124
Davis Development Co.	144
DeForest's Training, Inc.	17
Dow Radio	151
Dunn-Wright Electric Co.	132
Editors & Engineers, Ltd.	95
Eddie Electronics Inc.	202
Eichel Electronics	200
Electro Sales Co.	196
Electro-Technical Industries	192
Electro-Voice, Inc.	127
Electronic Corp. of America	118
Electronic Instrument Co., Inc.	164
Electronic Products Co.	150
Electronic Sales Co.	140
Electronic Supplies	160
Electroncraft Inc.	183
Electronics Institute, Inc.	126
Emmons Radio Supply	130
EPCCO	195
Ereco (Dick Rose)	176
Esege Sales Co., Ltd.	120, 192, 207

ADVERTISERS Page No.

Espey Mfg. Company, Inc.	187
Etude Electronic Lab.	180
Fair Radio Sales	203
Farwest Trading Company	157
Federated Purchaser, Inc.	204
Feller Engineering Company	171
Franklin-Ellis Co.	181
Freed Transformer Co., Inc.	172
G & G Radio Parts Service	104, 105
General Cement Mfg. Co.	280
General Electric Company	33, 83
General Test Equipment	180
Goodheart, R. E.	180
Greenlee Tool Co.	158
Greenwich Sales Co.	173
Greylock Electronic Supply Co.	158
Halldorson Company, The	280
Hallcrafters Co., The	1
Hallmark Electronics Corp.	108, 110
Harrison Radio Corporation	160
Harvey Radio Company, Inc.	121
Heath Company, The	90, 91, 92, 93
Henry Radio Stores	182
Howard Machine Products Co.	111
Hytron Radio and Electronics Corp.	6
Indiana Technical College	187
Institute of Radio & Television, The	180
Instructograph Company	196
Instrument Associates	186
International Electric Co.	116
International Resistance Co.	120
JED Mfg. Co., Inc.	206
James Vibrapower Co.	156
Jensen Industries	280
Jensen Mfg. Co.	1
Johnson Company, E. F.	1
Johnson Company, E. M.	197
Johnson's Fair	152
Joseph, Irving	115
Joyce Radio Distributing Co.	206
Kayline Distributing Company	147
Klein, Manuel	185
LaPointe Plasmomold Corp.	138
LaFayette-Concord	100
Lake Radio Sales Co.	182
Leeds Radio Co.	131
Leotone Radio Co.	94
Lera Labs.	198
Life Electronics Sales	134
Liftron Company	192
Lifetime Sound Equipment Co.	180
Lincoln Engineering School	185
Long Island Radio Co.	114
Mallory & Co., Inc., P. R.	Third Cover
Martin School of Radio Arts, Don	187
Maryland Distributors	196
Mass. Radio School	207
Micro-Vox	146
Mid-America	186
Midway Sales Co.	197, 208
Midwest Radio & Television Corp.	135
Milwaukee School of Engineering	148
Minnesota Electronics Corp.	121
Morris Radio Shack	116
Motor Industries Co.	183
Murray Hill Books, Inc.	26, 96, 112
McGee Radio Company	73, 74, 75, 76, 77, 78, 79, 80, 81
McGraw-Hill Book Company, Inc.	286
McMurdo Silver Company, Inc.	12
Nation Wide Radio	184
National Equipment & Supply Co., Inc.	81
National Radio Institute	3
National Schools	23
Newark Electric Company, Inc.	177
Newark Radio & Television	136
Newcomb Audio Products Co.	80
Niagara Radio Supply Corp.	100, 175
Oelrich Publications	116
Offenbach & Reimus Co.	165
Ohmite Manufacturing Co.	14
Olin Industries, Inc.	15

ADVERTISERS	Page No.
Onan & Sons, Inc., D. W.	164
Opad-Green Company	88
Peak Electronics Co.	180
Phillips Mfg. Co., Inc.	18
Photocon Sales	167
Potter Radio Company	188
Precision Apparatus Co.	153
Premax Products	208
Progressive Electronics Co.	132
Quam Nichols Company	199
R.C.A. Institutes, Inc.	183
R.L. Electronic Corporation	178
R & M Radio Company	143
R & T Electronics Company, Inc.	126
Radcom Engineering Co.	197
Radiart Corp., The	25
Radio Apparatus Co.	120
Radio Corporation of America	10, 11
Radio Craftsmen, Inc., The	191
Radio Ham Shack, Inc.	113
Radio Parts Company	145
Radio Parts Distributors	196
Radio Research Products	196
Radio Supply & Engineering Co., Inc.	174
Radiomart, Inc.	189
Radionic Equipment Co.	193
Radolek Company	134
Rauland Corp., The	179
Raytheon Mfg. Co.	28
Robinson Sherman Playing Cards	102
Rose Company	148
Sams & Company, Inc., Howard W.	19
San Francisco Radio & Supply Co.	159
Sarvi Electronics Mfg. Co.	190
Schub's Radio Parts, Inc.	150
Senco Radio, Inc.	123
Servo-Tek Products Co.	144
Shure Brothers, Inc.	133
Sightmaster	158
Smith, Wardell	187
South River Metal Products Co.	154
Spellman Television Co., Inc.	134, 141
Sprague Products Company	22
Sprayberry Academy of Radio	7
Stahl, Inc., Michael	139
Standard Radio & Electronic Products Co.	167
Stanton Radio Supply	187
Strickland Electric Co.	194
Sun Radio & Electronics Co., Inc.	120
Sun Radio of Washington, D. C.	178
Supreme, Inc.	107
Supreme Publications	103, 202
Sutton's Wholesale Electronics, Bill	193
Sylvania Electric	Fourth Cover
TAB	89, 163
Tapetone Manufacturing Corp.	160
Technical Radio Parts Co.	204
Telectron Company	196
Telemark Electronics Corporation	182
Television Assembly Co.	87
Television Industries	114
Telex, Inc.	153
Transvision, Inc.	117, 171
Tri-State College	185
Triplett Electrical Instrument Co.	29, 210
Troup Engineering Co.	185
Turner Company, The	137
Unlited Surplus Materials	102
Universal General Corp.	176
Vaco Products Company	201
Valparaiso Technical Institute	191
Walmar Distributing Co.	146
Ward Leonard	157
Ward Products Corporation, The, Division of The Gabriel Company	99
Warren Distributors	162
Waterproof Electric Company	199
Weber Electric	197
Weller Manufacturing Co.	150
Wells Sales, Inc.	129
Western Radio Communications Institute	202
Wholesale Radio Parts Co., Inc.	166
Workshop Associates Incorporated	168
World Radio Laboratories, Inc.	161
Wright, Inc.	188
Y.M.C.A. Trade & Technical Schools	200



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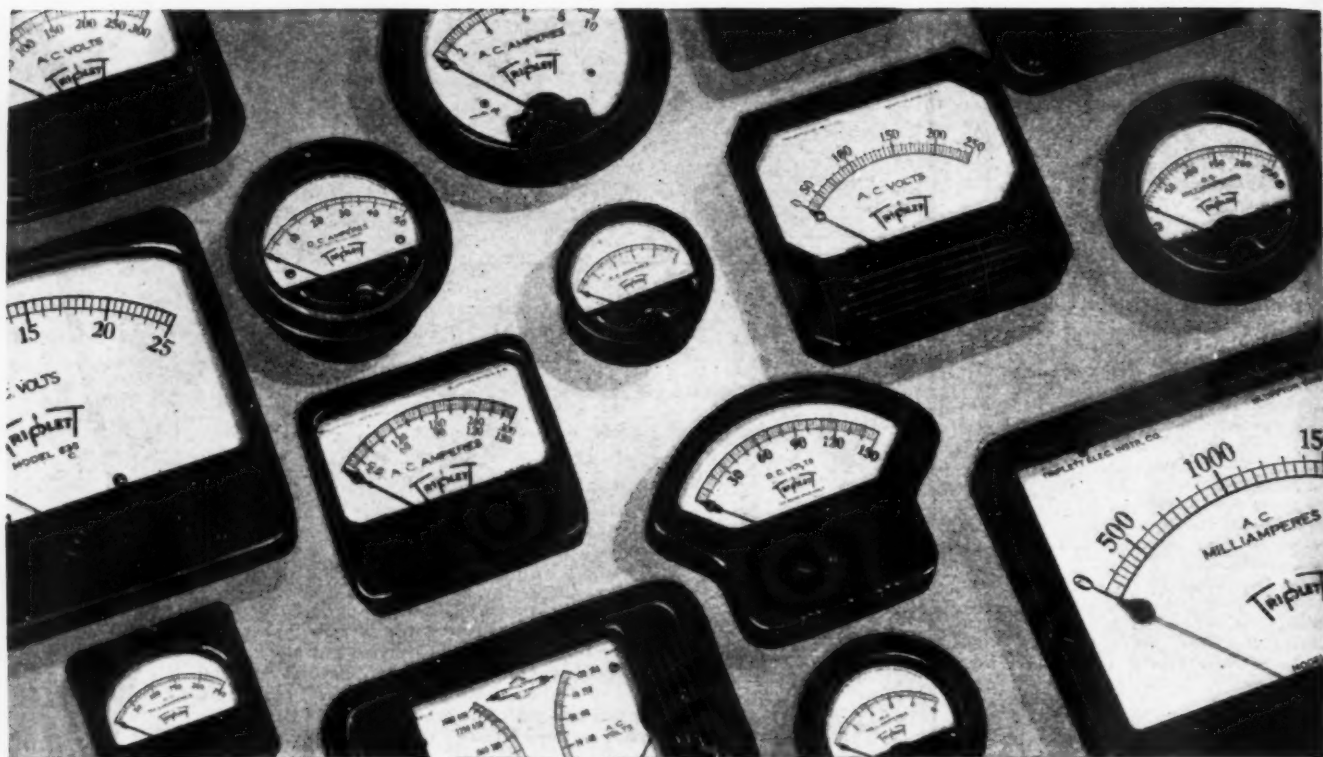
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